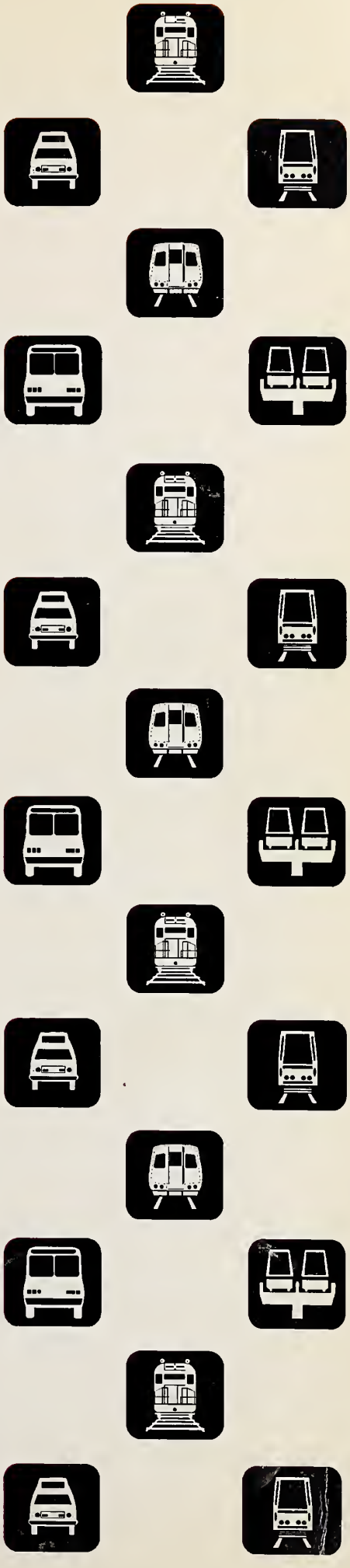
Federal Transit Administration

NATIONAL TRANSIT SUMMARIES AND TRENDS

For the 1994 National Transit Database Report Year



CAUTION: Extensive efforts have been made to assure the quality of information contained in this report. It is impossible, however, to achieve complete accuracy and consistency of the reported data. In addition, the reported data do not include all relevant information generally necessary to explain apparent differences in performance (e.g., information related to work rules, topography, climate, and unusual events such as strikes and service start-ups). Users of this report, therefore, should be careful not to draw unwarranted conclusions based solely on the data contained herein.

National Transit Summaries and Trends

For the 1994 National Transit Database Report Year

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Executive Summary

Overview

The *1994 National Transit Summaries and Trends (NTST)* provides an overview of the national mass transit industry. The *NTST* highlights the aggregate financial and operational characteristics and trends of mass transit for the 5-year period 1990-1994 and the 10-year period 1985-1994. The *NTST* presents key statistics and performance indicators for the transit industry of the United States.

This report presents a national transit profile, as well as profiles for urbanized areas with populations under 200,000; 200,000 to 1 million; and over 1 million. The national transit profile is provided in this Executive Summary. The exhibits throughout the *NTST* reflect national transit profile information by size of urbanized area. The national transit profile provides aggregate transit service performance and financial information for 1994. Performance indicators are used to measure the effectiveness and efficiency of transit service supplied and the cost effectiveness of that service. These performance indicators are presented by mode of service and by type of service (directly operated versus purchased transportation services). Performance indicators by size of urbanized area are presented in selected instances.

The chapters include the national transit profile; key characteristics of urbanized areas; key modal characteristics of individual transit agencies; capital funding; operating funding and expenses; service supplied and consumed; safety; and reliability and maintenance.

The following observations have been made based on data received in the 1994 Report Year:

Capital Funding

- Capital funding of the nation's public transit systems decreased by nearly 2.3 percent from 1993 to 1994. Capital investment increased 23.4 percent since 1990. Fixed guideway systems investments accounted for 71 percent of capital expenditures. Federal capital assistance accounted for 45 percent of capital funding in 1994.

Operating Funding and Expenses

- Passenger fares accounted for 37.3 percent of the $17.3 billion required to operate transit services in 1994, while local assistance accounted for 33.5 percent. State assistance provided 21 percent, while Federal assistance accounted for slightly under 5 percent. Other sources of funding accounted for the remaining 3.3 percent.

Service Supplied and Consumed

- Over 7.7 billion unlinked trips used some mode of transit service in 1994, amassing 37.9 billion passenger miles. There were almost 2.7 billion miles of vehicle revenue service provided, with over 73,600 transit vehicles operating daily in maximum service.

Safety, Reliability, and Maintenance Effectiveness

- The national rate of transit injuries is 793 injuries per 100 million unlinked passenger trips for all modes combined. Transit service reliability as measured by the number of vehicle revenue miles per roadcall decreased from 1993 by 7 percent for bus.

National Transit Profile
1994

General Information (System Wide)

Service Consumption (millions)	
Annual Passenger Miles	37,881.5
Annual Unlinked Trips	7,701.6
Average Weekday Unlinked Trips	25.6
Average Saturday Unlinked Trips	13.3
Average Sunday Unlinked Trips	8.4

Service Supplied	
Annual Vehicle Revenue Miles (millions)	2,679.5
Annual Vehicle Revenue Hours (millions)	180.3
Total Fleet	92,436
Vehicles Operated in Maximum Service	73,648
Base Period Requirement	32,279

Vehicles Operated in Maximum Service

Directly Operated	**Vehicles**	**Agencies ***
Bus	40,543	339
Heavy Rail	8,277	14
Commuter Rail	3,828	9
Light Rail	769	19
Demand Response	2,976	185
Other	1,742	39
Total	**58,135**	**605**

Purchased Transportation	**Vehicles**	**Agencies ***
Bus	3,180	122
Heavy Rail	0	0
Commuter Rail	521	10
Light Rail	0	0
Demand Response	9,852	257
Other	1,960	20
Total	**15,513**	**409**

Financial Information (System Wide)

Sources of Operating Funds Expended (millions)	
Passenger Fares	$6,466.4
Local Funds	5,815.4
State Funds	3,626.7
Federal Assistance	861.5
Other Funds	574.7
Total Operating Funds Expended	**$17,344.7**

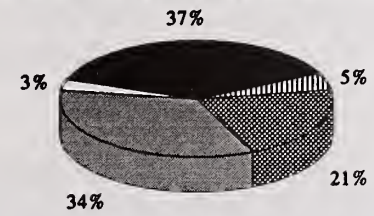
Summary of Operating Expenses (millions)	
Salaries/Wages/Benefits	$12,216.3
Materials & Supplies	1,512.2
Purchased Transportation	988.4
Other Expenses	1,602.9
Total Operating Expenses	**$16,319.9**
Reconciling Cash Expenditures (millions)	$961.4

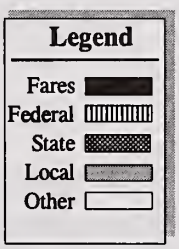
Sources of Capital Funds Expended (millions)	
Local Funds	$2,074.8
State Funds	1,005.5
Federal Assistance	2,518.1
Total Capital Funds Expended	**$5,598.4**

Uses of Capital Funds (millions)

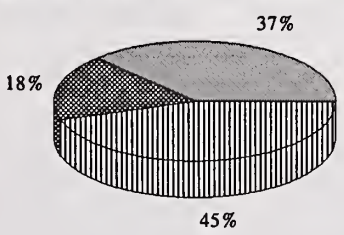
	Rolling Stock	**Facilities and Other**	**Total**
Bus	$611.9	$736.1	$1,348.0
Heavy Rail	212.6	1,857.4	2,070.1
Commuter Rail	226.6	1,159.8	1,386.4
Light Rail	56.4	465.8	522.3
Demand Response	43.3	18.6	61.9
Other	100.5	109.1	209.5
Total	**$1,251.3**	**$4,346.9**	**$5,598.2**

Sources of Operating Funds Expended





Sources of Capital Funds Expended



* Number of Agencies by Mode

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Introduction

Purpose of this Publication

The 1994 *National Transit Summaries and Trends (NTST)* highlights aggregated financial and operational characteristics and trends for key statistics and performance indicators of the nation's mass transit industry. The *NTST* is developed from the National Transit Database (NTD) and thus represents a portion of the 1994 National Transit Database Annual Report. This is the fifth annual edition of the *NTST,* which provides a picture of the mass transit industry in 1994, as well as 5-year and 10-year compilations of selected transit industry statistics. The NTST serves as a reference for transit professionals, researchers, and policy makers, and it describes the current condition of urban mass transportation in the United States.

Comments Welcomed

Several organizational changes, as well as additional data aggregations, have been made from the 1993 edition of the *NTST* in response to comments received. Suggestions and comments regarding this document are encouraged and welcomed.

Report Organization and Overview

The *NTST* is organized to first offer a national transit profile followed by chapters on key modal characteristics of transit agencies; key characteristics by urbanized areas; capital funding; operating funding and expenses; service supplied and consumed; safety; and reliability and maintenance effectiveness. An appendix displaying an aggregated national transit database report is included by individual reporting form.

Chapter 1: National Transit Profile

The National Transit Profile provides aggregate operating statistics and financial data for the transit industry. Profiles are also presented by size of urbanized area (UZA). Key financial and operating data, along with related performance indicators, are provided for the 10-year period 1985-1994.

Chapter 2: Key Modal Characteristics of Transit Agencies

Data on operations and performance indicators for major transit agencies for bus and demand response are presented in this chapter. The same type of data is also presented for all agencies operating heavy rail, commuter rail, light rail, trolleybus, ferryboat, and automated guideway transit agencies. The latter three modes are discussed due to their uniqueness and their respective dominance within the modal category referred to as "other".

Chapter 3: Key Characteristics by Urbanized Areas

This chapter offers insight into the characteristics of transit services based on UZA size. Data are presented for UZAs under 200,000 population, for UZAs that have populations between 200,000 and 1 million, and for UZAs of over 1 million population.

Chapter 4: Capital Funding

This chapter discusses sources of capital funding and its uses (rolling stock, facilities, and other uses) by mode and size of UZA.

Chapter 5: Operating Funding and Expenses

Sources of operating funding, as well as the cost of operating service, are discussed in this chapter. A reporting change was introduced in 1994 which required agencies to report only the operating funds that were expended in the report year. Operating funds received during the report year that did not result in an expense in that year were not reported. Operating expenses are allocated by mode, by function (vehicle operations, vehicle maintenance, non-vehicle maintenance, and general administration), and by object class. Object classes are groupings of expenses on the basis of goods or services purchased. Object classes include salaries and wages, fringe benefits, services, material and supplies, purchased transportation, and other expenses.

Chapter 6: Service Supplied and Consumed

This chapter provides an analysis of service effectiveness and discusses both the amounts and kinds of transit services provided and utilized. Performance measures are used to evaluate the effectiveness of transit service by reflecting ridership and operating costs by various measures of service supplied.

Chapter 7: Safety

This chapter discusses measures of data designed to offer insight into safety-related issues regarding transit.

Chapter 8: Reliability and Maintenance Effectiveness

This chapter presents measures of reliability of service and effectiveness of vehicle maintenance. Data about maintenance expense and service interruptions are also included.

Inflation

All revenue and cost information are represented in dollars as actually reported. Data have not been adjusted to reflect the impact of inflation. The consumer price index (urban) increased 16.5 percent between 1990 and 1994. The increase from December 1993 to December 1994 was 2.8 percent.

Rounding

Rounding may lead to minor variations in total values from one table to another for similar data or may lead to instances where percentages may not add to 100.

Number of Reporters

The NTD records reporters in several ways. One way is to record the actual number of individual reporters in each report year. For the 1994 Report Year, the number of individual reporters is 524. Of this number, 31 transit agencies received exemptions from detailed reporting and 4 agencies were deleted following an extensive review process. Thus, 489 individual reporters are included in the full database. Data from agencies granted exceptions are included only for the transit agency mode(s) and type(s) of service provided and the UZAs served. See **Exhibit 1** and Chapter 3.

The NTD can also be summarized by the number of modes and types of service by individual mode. Mode and type of service information provide a better representation of the NTD reporting, because most transit agencies operate more than one mode and have more than one type of service.

As shown in **Exhibit 1**, the number of NTD reporters by mode and type of service has grown by 11 percent since 1990. In addition, the number of reporters for bus declined between 1990 and 1992 and increased from 1992 to 1994. The decline between 1990 and 1992 is primarily due to several reporting changes implemented to reduce reporting

Exhibit 1

Number of Transit Agencies Reporting by Mode and Type of Service 1990-1994

Type of Service	1990	1991	1992	1993	1994
Bus					
Directly Operated	374	356	339	352	357
Purchased Transportation	103	102	107	118	126
Total	477	458	446	470	483
Heavy Rail					
Directly Operated	12	12	13	14	14
Purchased Transportation	-	-	-	-	-
Total	12	12	13	14	14
Commuter Rail					
Directly Operated	12	10	9	9	9
Purchased Transportation	7	8	9	10	10
Total	19	18	18	19	19
Light Rail					
Directly Operated	13	14	15	17	19
Purchased Transportation	1	1	1	-	-
Total	14	15	16	17	19
Demand Response					
Directly Operated	173	170	173	185	201
Purchased Transportation	212	219	226	253	263
Total	385	389	399	438	464
Other					
Directly Operated	36	40	41	36	39
Purchased Transportation	11	13	18	19	20
Total	47	53	59	55	59
Total					
Directly Operated	620	602	590	613	639
Purchased Transportation	334	343	361	400	419
Total	954	945	951	1,013	1,058

burden and to develop more consolidated reporting. The number of demand response reporters has increased steadily each year. There are 20.5 percent more demand response reporters in 1994 than in 1990.

The number of reports indicating purchased transportation of transit service has also increased. As shown in **Exhibit 1**, this increase is most noticeable in the number of bus and demand response reporters. The number of reports reflecting purchased bus service has increased by 21.3 percent since 1990, while the number of reports incorporating purchased demand response service has increased by 22.3 percent since 1990. The bus increase is related to a change in reporting thresholds as one means of reducing the reporting burden.

Type of Service

The data in the NTD are organized by mode and type of service. There are two types of service: purchased transportation service and directly operated service.

A transportation service is considered purchased transportation in the NTD when a contractual relationship exists between at least two entities. The contractual relationship is for the provision of public transportation service and includes payments or accruals to sellers, fare revenues retained by the seller, and other expenses incurred by the buyer (purchaser) for items such as contract administration, services, and materials (advertising, customer information services, fuel maintenance, etc.). Generally, the entity buying the service is a public agency and the seller is a private organization.

The other type of service in the NTD is directly operated service. The service provided by a transit agency is considered directly operated when the transit agency is the entity responsible for generating the service to the public. Directly operated service can be provided by either a public or private entity. In the NTD, a typical transit agency has both directly operated service and purchased transportation.

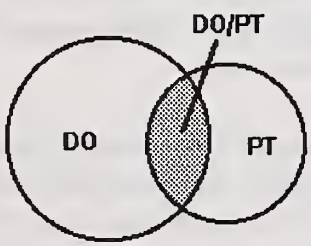
Reporting Purchased Transportation Data

There are two different ways of reporting purchased transportation data in the NTD. The most common way is the buyer reporting to the NTD and including the data related to its purchased transportation service in its report. In most cases, the buyer has a directly operated service in addition to the purchased transportation service; however, some reporters have exclusively purchased transportation and report on behalf of their sellers. The reporting requirements for purchased transportation included in the buyer's report are a subset of the data available in the NTD. This subset includes total operating expenses for the buyer (the lump expense without allocation by function or object class); transit way mileage which includes data related to fixed guideway directional route miles; and other infrastructure data by mode, service supplied, service consumption, and vehicle inventory. The operating expense incurred by the buyer is allocated under object class "purchased transportation in report" and is coded as 508.01. The cost for the seller is unknown when purchased transportation is reported under object class 508.01. In addition, all financial and operational data are aggregated for all purchased transportation providers under contract.

The second way of reporting purchased transportation is the seller filing its NTD report. In this case, the purchased transportation data are reported from a directly operated perspective and the reporter is required to provide additional data that are used in the full database depending on the size of the agency reporting. NTD requires all private carriers operating more than 100 vehicles in maximum service to file a separate NTD report. However, some private carriers operating less than 100 vehicles in maximum service also submit NTD reports. These are, in most cases, private providers reporting on behalf of their buyers which are not NTD reporters. When the seller files a separate report, the buyer reports only the total operating expense incurred for the service provided. This expense, which is the cost for the buyer, is allocated under object class "purchased transportation filing a separate report" and is coded as 508.02 in the buyer's report. The seller, however, provides a full separate report and its expenses are fully allocated by function and object class. The total operating expense in the seller's report is the cost to the seller.

Because of their definition, directly operated and purchased transportation categories are not mutually exclusive categories of service; therefore, a full account of any data item for both categories cannot be totaled without resulting in a double counting of the data. In addition, any aggregation of purchased transportation data is limited to the data subset required from reporters that included purchased transportation in their reports. In **Exhibit 2**, directly operated (DO) and purchased transportation (PT) are represented by two different circles. The DO circle is bigger than the PT circle, because directly operated is a more common category of service than purchased transportation. The intersection of the two circles (shaded area) represents all private providers reporting their directly operated services and is, therefore, privately generated transit data.

Directly Operated and Purchased Transportation Data **Exhibit 2**

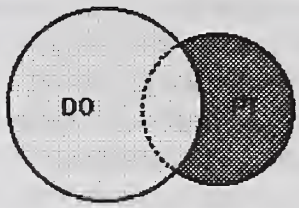


The portion of the DO circle that does not overlap the PT circle represents data for services provided by public agencies directly operating their services (no purchased transportation). These data can be generally considered as publicly generated transit data. The portion of the PT circle that does not overlap the DO circle is purchased transportation data reported by public agencies included in the DO circle and is privately generated transit data reported by the buyer (public agency).

In many exhibits of the *NTST*, the aggregation of data is split between directly operated and purchased transportation in the report (object class 508.01). A full account of directly operated service is provided. However, the purchased transportation data are partial and do not include private providers filing their own reports, since private providers report from a directly operated perspective. Schematically, the exhibits by type of service (directly operated and purchased transportation) are split in the way shown in **Exhibit 3**.

Exhibit 3

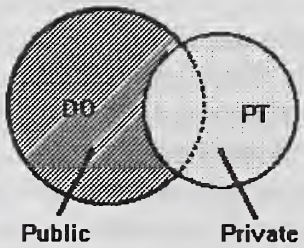
Splitting Data Between Directly Operated and Purchased Transportation



In some instances, it might be more interesting to split the data by private and public providers. Schematically, a split between the public and private data is shown in **Exhibit 4**.

Exhibit 4

Splitting Data Between Public and Private Providers



The intersection of the two circles represents the purchased transportation directly operated. These data are included in **Exhibit 5.** For a given exhibit where the data are split by type of service (directly operated and purchased transportation), the sum of the data item displayed in **Exhibit 5** with the purchased transportation data item included in the exhibit under analysis will result in the total purchased transportation data item. Similarly, the data included in **Exhibit 5** subtracted from the total directly operated data item will result in the total data item generated by public agencies.

Exhibit 5

Key Statistical Indicators for Purchased Transportation Agencies That Report as Directly Operated 1994

Mode	Number of Modes Reported	Operating Expense (000s)	Unlinked Passenger Trips (000s)	Passenger Miles (000s)	Vehicle Revenue Hours (000s)	Vehicle Revenue Miles (000s)	Vehicles Operated in Maximum Service
Bus	22	$451,544.8	233,400.7	1,512,519.5	6,371.0	92,711.2	2,641
Commuter Rail	2	125,383.0	35,124.0	758,329.4	494.1	16,474.0	480
Demand Response	10	26,516.5	2,623.1	22,955.5	1,091.0	12,855.4	443
Total	34	$603,444.3	271,147.8	2,293,804.4	7,956.1	122,040.6	3,564
% Directly Operated		4.1%	3.6%	6.4%	6.2%	5.3%	6.1%

Purchased transportation, from a directly operated perspective, affects only three modes in the NTD: bus, demand response, and commuter rail. All other modes which have purchased transportation have their data consolidated in the buyer's report. As displayed in **Exhibit 5**, there are 34 modes reported by 30 agencies reporting purchased transportation from a directly operated perspective. The percent of directly operated service is also included.

As mentioned, the total operating expense included in **Exhibit 5** is the expense incurred by the seller and not by the buyer of the purchased services. The sum of all operating expenses for public agencies for the purchase of the service included in **Exhibit 5** was $511.73 million (expense for object class 508.02). This figure appears inconsistent with the total operating expense incurred by the sellers, which was $603.44 million. One would expect a higher expense for the buyers, because expenses with marketing and contract administration, among other expenses, are incurred by the buyers and not by the sellers. There are three reasons for this discrepancy. First, some private providers report on behalf of public agencies that are not reporters of the NTD. Therefore, the NTD includes an expense for the seller without the corresponding expense for the buyer since the buyer does not report to the NTD. Second, some sellers are brokers that do not operate the service that they sell to public agencies. In this case, the buyer reports an expense for object class 508.02, but the expense for the seller is unknown in the NTD since the seller's data are reported by the broker. The third reason is related to inaccuracies in the reporting of object class 508.02 provided by an NTD reporter.

To determine the full accountability of purchased transportation data in the NTD, it is advisable to use the operating expense and operational data displayed in **Exhibit 5**, rather than the expense reported by the buyers in object class 508.02. However, if interested in analyzing performance ratios of private providers and the cost efficiency and effectiveness of the private sector in the NTD, it is advisable to take into account the average ratio between the seller's operating expense and the final cost for the buyer which is reported under object class 508.02. For the1994 Report Year, this ratio was determined by a subset of private providers filing their own reports in which operating expenses were reported by the buyers of their services. This figure is 0.94 for 1994. This factor should be applied to the total operating expense given in **Exhibit 5** for the purpose of providing an estimate of the real cost of purchased transportation to the public sector.

Exemption for Nine or Fewer Vehicles

Beginning with the 1991 Report Year, the Federal Transit Administration granted reporting exemptions to agencies with three or fewer non-fixed guideway vehicles operated in maximum service. This threshold was increased to five vehicles for the 1992 Report Year and to nine vehicles for the 1994 Report Year. Thirty-one agencies requested and were granted an exemption for 1994 compared with 28 agencies for the 1993 Report Year. Reporters who received this exemption do not submit data and therefore are not included in the database for capital, operating funding, operating expenses, and non-financial data. However, they are included in data related to UZAs reporting and in totals for transit agencies (See **Exhibit 1** and Chapter 3). The number of 5 or fewer vehicles exemptions granted in 1994 was 27 agencies, and 4 agencies operating between 5 and 9 vehicles in maximum service were also granted reporting exemptions.

Calculation and Treatment of Joint Modal Expenses

Prior to 1992, joint modal expenses were allocated by function only and were included as part of the "other" object class. Since 1992, reporters fully allocated joint expenses for each mode by function and object class. Operating funding reported in 1994 are the funds

that resulted in expenses in 1994. This is a reporting change introduced in 1994. Therefore, except for reconciling items, operating funding and operating expenses should be similar for the NTD 1994 Report Year.

Performance Indicators

The *NTST* presents several performance measures as indicators of efficiency and effectiveness. These indicators include operating expense per vehicle revenue hour, operating expense per vehicle revenue mile, unlinked passenger trips per vehicle revenue hour, unlinked passenger trips per vehicle revenue mile, operating expense per unlinked passenger trip, and operating expense per passenger mile. Most of these measures are presented by mode and type of service.

Relative Impacts of the Data

The data in the NTD are highly concentrated in large UZAs as seen in **Exhibit 6.** This concentration is not surprising, given the nature of public transit, especially mass transit, which provides public transportation services in densely populated areas. In terms of service consumed, over 88 percent of all data are reported by agencies in UZAs with over 1 million population. In addition, 88.1 percent of operating expenses and 92.5 percent of capital funds expended were reported by agencies in these large population centers.

Exhibit 6

Relative Impacts of the Data (Percentage) by UZA Size
1994

	Under 200,000	200,000 to 1 Million	Over 1 Million
Service Consumed			
Passenger Miles	2.5	7.3	90.1
Unlinked Trips	3.1	8.9	88.0
Service Supplied			
Vehicle Revenue Miles	6.9	14.0	79.1
Vehicle Revenue Hours	7.4	14.7	77.9
Vehicles Oper. Max. Service	8.7	15.4	75.9
Operating Funds Total	3.2	8.7	88.1
Passenger Fares	1.9	5.1	93.0
Operating Expenses Total	3.3	8.5	88.1
Capital Funds Total	2.1	5.4	92.5
Uses of Capital Funds			
Rolling Stock	5.9	10.6	83.5
Facilities and Other	1.0	4.1	94.9

Chapter 1
National Transit Profile

Introduction

This chapter commences with **Exhibit 7**, the national transit profile, which provides an overview of the mass transit industry in the United States by displaying aggregated data for 1994. These data include sources of operating and capital funding, a summary of operating expenses, uses of capital funds, and service supplied and consumed. This information is also given for each of the five major modes of service: bus, heavy rail, commuter rail, light rail, and demand response. Additionally, performance indicators for each mode are graphically depicted and show measures of service and cost effectiveness and efficiency.

The chapter concludes with exhibits reflecting 10 years of national transit data, including vehicle revenue miles, unlinked passenger trips, operating expenses, passenger fare revenue, and associated performance measures.

Service Supplied and Service Consumed

In terms of service supplied and consumed, 1994 was a good year for the nation's transit industry. Service consumed as measured by unlinked passenger trips increased 3.6 percent from 1993, with over 7.7 billion unlinked passenger trips. In the aggregate, service supplied, as measured by vehicle revenue miles, increased 3.3 percent, amassing nearly 2.7 billion revenue miles. From 1985 to 1994, the miles of revenue service consistently increased for all modes by an average of 49.98 million revenue miles per year. However, the pace of increase in the last 3 years increased significantly; from 1992 to 1993, an increase of 59.2 million revenue miles was observed; and, from 1993 to 1994, the increase was 86.3 million revenue miles or 3.3 percent.

At the modal level, revenue miles increased slightly for bus, which has been the trend for this mode for the last 10 years. From 1985 to 1994, revenue miles increased by 8.3 percent for bus. The increase is primarily explained by new starts and the creation of new routes for existing services. Rail modes showed a trend of increase in revenue miles greater than bus. From 1985 to 1994, revenue miles for heavy rail, commuter rail, and light rail increased 16.4, 25.4, and 109.4 percent, respectively. The high increase in revenue miles for light rail is explained in part by the creation of new systems and in part by a reporting change by the Massachusetts Bay Transportation Authority (Boston) which previously reported some light rail lines as heavy rail. In 1994, these data were reported as light rail. Because these light rail lines are located in dense corridors, with very high demand, the contribution of the revenue mileage of these lines is highly significant. In 1994, the revenue mileage for light rail increased by nearly 23.8 percent. The reporting

Exhibit 7
National Transit Profile
1994

General Information (System Wide)

Service Consumption (millions)	
Annual Passenger Miles	37,881.5
Annual Unlinked Trips	7,701.6
Average Weekday Unlinked Trips	25.6
Average Saturday Unlinked Trips	13.3
Average Sunday Unlinked Trips	8.4

Service Supplied	
Annual Vehicle Revenue Miles (millions)	2,679.5
Annual Vehicle Revenue Hours (millions)	180.3
Total Fleet	92,436
Vehicles Operated in Maximum Service	73,648
Base Period Requirement	32,279

Vehicles Operated in Maximum Service Directly Operated	Vehicles	Agencies *
Bus	40,543	339
Heavy Rail	8,277	14
Commuter Rail	3,828	9
Light Rail	769	19
Demand Response	2,976	185
Other	1,742	39
Total	**58,135**	**605**

Purchased Transportation	Vehicles	Agencies *
Bus	3,180	122
Heavy Rail	0	0
Commuter Rail	521	10
Light Rail	0	0
Demand Response	9,852	257
Other	1,960	20
Total	**15,513**	**409**

Financial Information (System Wide)

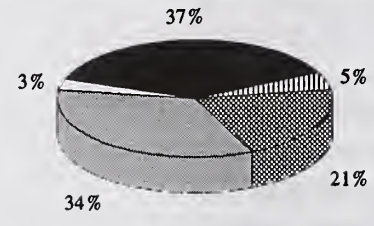
Sources of Operating Funds Expended (millions)	
Passenger Fares	$6,466.4
Local Funds	5,815.4
State Funds	3,626.7
Federal Assistance	861.5
Other Funds	574.7
Total Operating Funds Expended	**$17,344.7**

Summary of Operating Expenses (millions)	
Salaries/Wages/Benefits	$12,216.3
Materials & Supplies	1,512.2
Purchased Transportation	988.4
Other Expenses	1,602.9
Total Operating Expenses	**$16,319.9**
Reconciling Cash Expenditures (millions)	$961.4

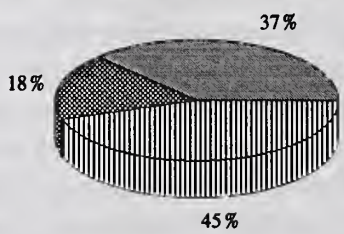
Sources of Capital Funds Expended (millions)	
Local Funds	$2,074.8
State Funds	1,005.5
Federal Assistance	2,518.1
Total Capital Funds Expended	**$5,598.4**

Uses of Capital Funds (millions)	Rolling Stock	Facilities and Other	Total
Bus	$611.9	$736.1	$1,348.0
Heavy Rail	212.6	1,857.4	2,070.1
Commuter Rail	226.6	1,159.8	1,386.4
Light Rail	56.4	465.8	522.3
Demand Response	43.3	18.6	61.9
Other	100.5	109.1	209.5
Total	**$1,251.3**	**$4,346.9**	**$5,598.2**

Sources of Operating Funds Expended



Sources of Capital Funds Expended



* Number of Agencies by Mode

Exhibit 7 (continued) **National Transit Profile by Mode**

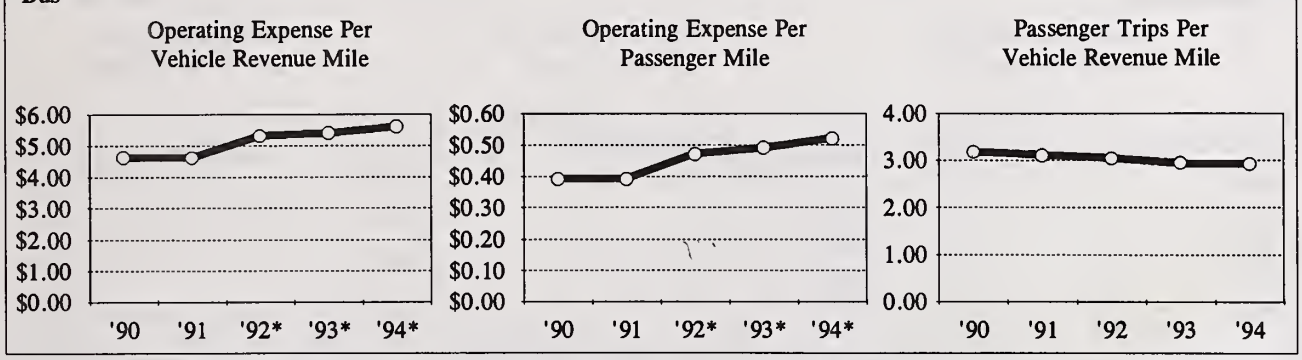
Characteristics

	Bus	Heavy Rail
Operating Expense (millions)	$8,859.5	$3,786.2
Capital Funding (millions)	$1,348.0	$2,070.1
Annual Passenger Miles (millions)	17,195.4	10,668.0
Annual Vehicle Revenue Miles (millions)	1,585.8	516.0
Annual Unlinked Trips (millions)	4,629.4	2,169.4
Average Weekday Unlinked Trips (millions)	15.4	7.2
Annual Vehicle Revenue Hours (millions)	123.0	25.0
Fixed Guideway Directional Route Miles	1,307.4	1,455.2
Total Fleet	53,720	10,282
Average Fleet Age in Years	8.5	18.6
Vehicles Operated in Maximum Service	43,723	8,277
Peak to Base Ratio	1.7	1.8
Percent Spares	23%	24%

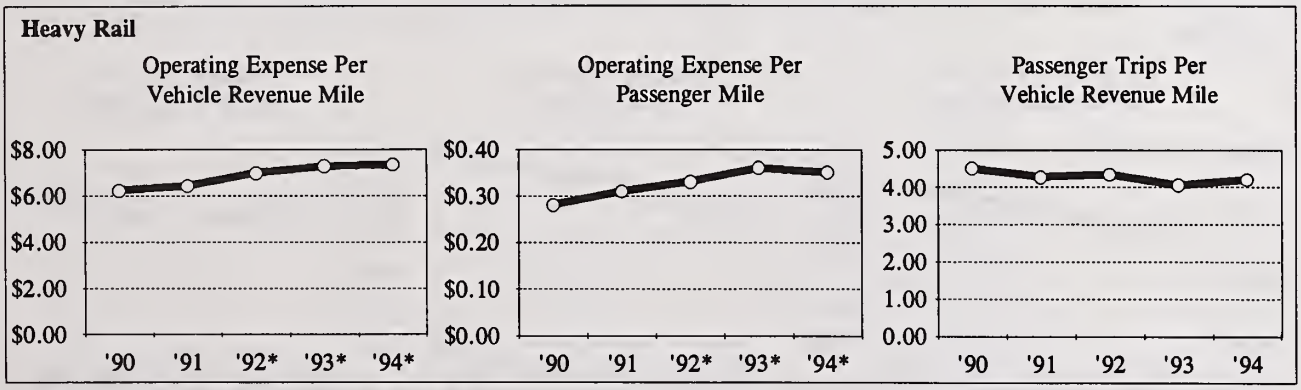
Performance Measures

Service Efficiency		
Operating Expense/Vehicle Revenue Mile	$5.59	$7.34
Operating Expense/Vehicle Revenue Hour	$72.01	$151.70
Cost Effectiveness		
Operating Expense/Passenger Mile	$0.52	$0.35
Operating Expense/Unlinked Passenger Trip	$1.91	$1.75
Service Effectiveness		
Unlinked Passenger Trips/Vehicle Revenue Mile	2.92	4.20
Unlinked Passenger Trips/Vehicle Revenue Hour	37.63	86.92

Bus



Heavy Rail



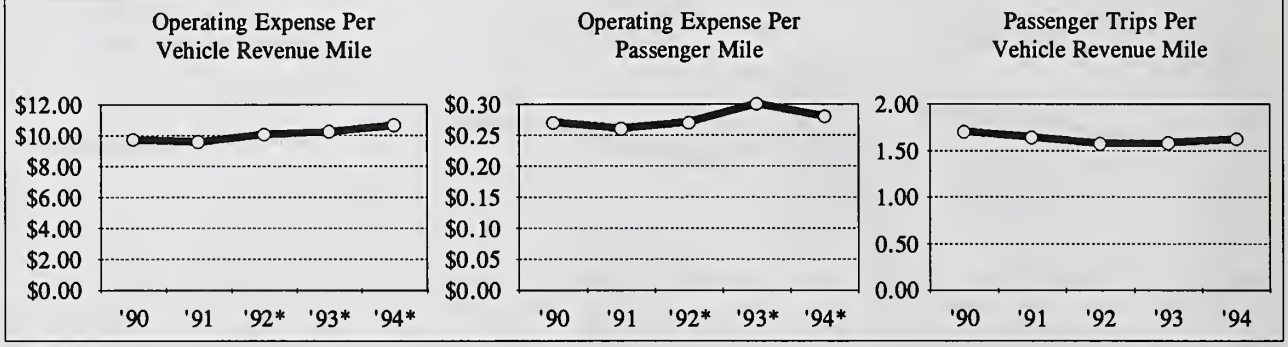
* Joint expenses eliminated and allocated to individual modes.

Source: 1994 National Transit Database

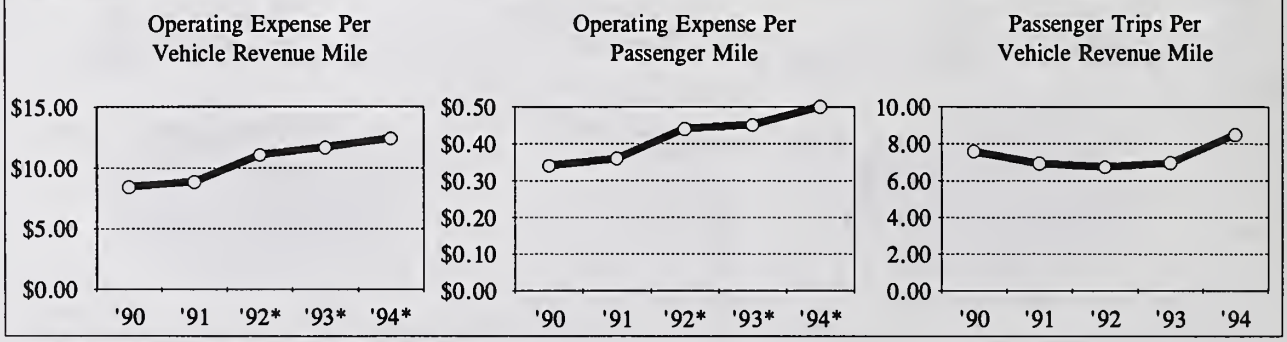
Exhibit 7 (continued) **National Transit Profile by Mode**

Characteristics	Commuter Rail	Light Rail
Operating Expense (millions)	$2,227.8	$411.6
Capital Funding (millions)	$1,386.4	$522.3
Annual Passenger Miles (millions)	7,995.9	831.0
Annual Vehicle Revenue Miles (millions)	209.5	33.3
Annual Unlinked Trips (millions)	339.0	282.2
Average Weekday Unlinked Trips (millions)	1.2	0.9
Annual Vehicle Revenue Hours (millions)	6.2	2.3
Fixed Guideway Directional Route Miles	6,033.4	561.9
Total Fleet	5,126	1,031
Average Fleet Age in Years	19.2	14.3
Vehicles Operated in Maximum Service	4,349	769
Peak to Base Ratio	2.0	1.6
Percent Spares	18%	34%
Performance Measures		
Service Efficiency		
Operating Expense/Vehicle Revenue Mile	$10.63	$12.38
Operating Expense/Vehicle Revenue Hour	$359.37	$178.13
Cost Effectiveness		
Operating Expense/Passenger Mile	$0.28	$0.50
Operating Expense/Unlinked Passenger Trip	$6.57	$1.46
Service Effectiveness		
Unlinked Passenger Trips/Vehicle Revenue Mile	1.62	8.48
Unlinked Passenger Trips/Vehicle Revenue Hour	54.68	122.13

Commuter Rail



Light Rail



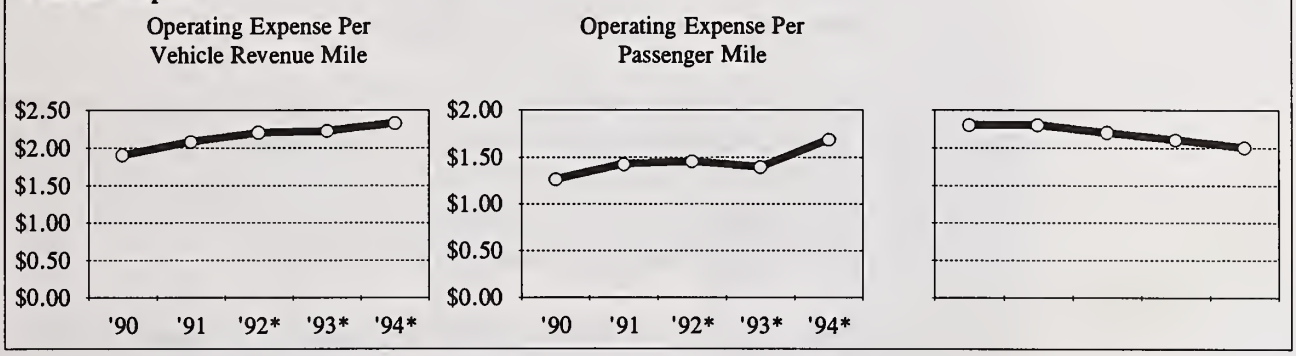
* Joint expenses eliminated and allocated to individual modes.

Source: 1994 National Transit Database

Exhibit 7 (continued) **National Transit Profile by Mode**

Characteristics	Demand Response
Operating Expense (millions)	$633.9
Capital Funding (millions)	$61.9
Annual Passenger Miles (millions)	376.6
Annual Vehicle Revenue Miles (millions)	272.8
Annual Unlinked Trips (millions)	54.1
Average Weekday Unlinked Trips (millions)	0.2
Annual Vehicle Revenue Hours (millions)	19.6
Fixed Guideway Directional Route Miles	N/A
Total Fleet	17,447
Average Fleet Age in Years	3.7
Vehicles Operated in Maximum Service	12,828
Peak to Base Ratio	N/A
Percent Spares	36%
Performance Measures	
Service Efficiency	
Operating Expense/Vehicle Revenue Mile	$2.32
Operating Expense/Vehicle Revenue Hour	$32.29
Cost Effectiveness	
Operating Expense/Passenger Mile	$1.68
Operating Expense/Unlinked Passenger Trip	$11.73
Service Effectiveness	
Unlinked Passenger Trips/Vehicle Revenue Mile	0.20
Unlinked Passenger Trips/Vehicle Revenue Hour	2.75

Demand Response



* Joint expenses eliminated and allocated to individual modes.

Source: 1994 National Transit Database

change by Boston contributed 65 percent of this increase, while the addition of new light rail systems accounted for 30 percent of the total increase. In real terms, 1994 was a stable year for existing light rail systems, but the implementation of new systems in metropolitan areas previously not served by this mode increased the overall potential ridership of light rail.

The revenue mileage for heavy rail and commuter rail increased 2.1 and 3 percent, respectively, from 1993 to 1994. The most significant aspect of heavy rail is that service supplied increased by 2.1 percent despite the "loss" of some high revenue mileage lines to light rail. Demand response was the mode with the second highest increase in revenue miles, with an increase of 12.1 percent in 1994. From 1985 to 1994, the increase in revenue miles for demand response was 302 percent. This increase is explained by a growing demand for this mode.

In the aggregate, transit service consumed, as measured by unlinked passenger trips, decreased during the 1985-1994 timeframe by nearly 8 percent. However, unlinked passenger trips increased 3.6 percent in 1994, bringing the total ridership back to 1991 levels. Bus and heavy rail are the only modes with a decline in unlinked passenger trips during the 1985-1994 timeframe. All other modes of service showed increases in ridership. Annual bus ridership declined by nearly 810 million unlinked passenger trips from 1985 to 1994. Bus service in 1994 accounted for nearly 15 percent fewer riders than in 1985; nonetheless, bus service accounted for 60 percent of the unlinked passenger trips made via transit in 1994, compared with 65 percent in 1985. Heavy rail also declined in ridership, carrying nearly 5 percent fewer riders in 1994 than in 1985.

In contrast, such modes as commuter rail, light rail, and demand response carried substantially greater numbers of riders in 1994 than in 1985. These modes show ridership increases of more than 23, 216, and over 227 percent, respectively, in 1994 compared with 1985. Again, a substantial part of the increase in the ridership for light rail for 1994 is explained by the reporting change by Boston mentioned earlier.

Comparing 1994 with 1993, all modes experienced increases in unlinked passenger trips with the exception of bus, which decreased by 0.2 percent. The ridership for heavy rail increased by approximately 6 percent despite the "loss" of some service to light rail as a result of the reporting change by Boston. Commuter rail displayed an increase of 5.6 percent in ridership for 1994 and light rail displayed a 50.5 percent increase. The contribution of new light rail systems to the increase in ridership for this mode for 1994 was 9.4 percent, and the contribution of the report change by Boston was 86 percent. Demand response experienced an increase in unlinked passenger trips of nearly 4 percent from 1993 to 1994.

Operating Expense

Operating expenses increased consistently in the last 10 years at an average rate of 6.1 percent a year or $634.9 million per year since 1985. The total increase for the 1985-1994 period is approximately 60 percent, disregarding inflationary effects. In 1994, the nation spent over $16.3 billion on public transit, with an increase of 5.5 percent from 1993 to 1994. This represents a net increase of $847.3 million. In the aggregate, in 1994,

there was a change in the trend for operating expenses, with an increase greater than the average yearly increase of the last 10 years. At the modal level, light rail and demand response were the modes with the highest increase in operating expenses. Operating expenses for light rail increased 31 percent compared with 1993, and demand response experienced an increase of 17.4 percent.

Exhibit 8 provides summaries of vehicle revenue miles, unlinked passenger trips, and operating expenses by mode from 1985 to 1994.

Ten Year Data Summary Tables
1985-1994

Exhibit 8

Vehicle Revenue Miles by Mode
(Millions)

Year	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
1985	1,463.8	443.2	167.1	15.9	90.4	24.7	2,205.1
1986	1,476.1	462.6	170.2	16.7	104.8	24.9	2,255.3
1987	1,497.2	473.9	169.9	18.0	113.4	25.6	2,298.0
1988	1,508.5	503.0	183.5	20.1	132.8	27.1	2,375.0
1989	1,506.4	513.1	190.2	20.5	152.1	23.1	2,405.4
1990	1,534.5	520.8	193.1	23.0	171.2	24.3	2,466.9
1991	1,552.3	508.3	197.9	26.6	185.8	27.8	2,498.7
1992	1,555.9	509.7	199.9	27.8	208.5	32.2	2,534.0
1993	1,578.3	505.2	203.4	26.9	243.4	36.0	2,593.2
1994	1,585.8	516.0	209.5	33.3	272.8	62.1	2,679.5

Unlinked Passenger Trips by Mode
(Millions)

Year	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
1985	5,438.7	2,289.8	275.3	130.7	23.8	191.4	8,349.7
1986	4,959.8	2,332.7	305.8	128.4	27.3	176.3	7,930.3
1987	4,795.7	2,402.1	310.9	131.3	29.2	196.6	7,865.8
1988	4,794.0	2,307.7	324.9	152.6	34.1	199.2	7,812.5
1989	4,838.1	2,541.9	329.6	161.1	36.7	190.6	8,098.0
1990	4,887.1	2,346.3	328.4	174.0	39.7	190.1	7,965.6
1991	4,825.5	2,167.0	323.8	183.6	42.4	192.6	7,734.9
1992	4,748.0	2,207.2	313.6	187.4	45.3	194.2	7,695.7
1993	4,638.5	2,045.6	320.8	187.5	52.0	188.3	7,432.7
1994	4,629.4	2,169.4	339.0	282.2	54.1	227.7	7,701.8

Operating Expense by Mode
(Millions)

Year	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
1985	$6,017.2	$2,847.5	$731.7	$140.1	$154.4	$306.1	$10,197.0
1986	6,336.0	3,101.6	1,640.3	158.2	176.2	309.0	$11,721.3
1987	6,737.0	3,234.7	1,748.4	171.6	211.2	254.0	$12,356.9
1988	6,994.8	3,524.0	1,889.2	197.2	251.6	261.3	$13,118.1
1989	7,295.0	3,703.5	2,068.1	209.4	322.5	284.1	$13,882.6
1990	7,778.6	3,825.0	2,156.8	236.0	385.5	322.8	$14,704.7
1991	8,329.6	3,841.2	2,175.4	289.7	442.6	325.2	$15,403.7
1992	8,625.1	3,555.1	2,169.7	307.2	499.8	341.6	$15,498.5
1993	8,514.0	3,669.0	2,080.0	314.0	540.0	355.7	$15,472.7
1994	8,859.5	3,786.2	2,227.8	411.6	633.9	400.9	$16,319.9

Performance Indicators

Performance indicators use two data elements and have been calculated only for those reports that include both data elements, such as revenue miles and hours for calculating average speed. Performance measures are generally divided into three main categories: impact measures, efficiency, and effectiveness. Impact measures, such as achievement of social, environmental, and energy conservation objectives, are not an amenable evaluation within the framework of the National Transit Database.

Efficiency measures compare inputs, such as dollars or labor, to outputs produced, such as miles or hours of service. Cost effectiveness measures compare inputs (dollars or labor) to the end product which is the service to the public, such as passenger trips or passenger miles. Service effectiveness measures compare the end product, such as passenger trips or passenger miles, to the service outputs, such as miles or hours of service.

Certain measures act as indicators of service and cost effectiveness and efficiency utilized for analysis. The efficiency of service is reviewed herein by an examination of operating expense per vehicle revenue mile. The effectiveness of service is considered through use of unlinked passenger trips per vehicle revenue mile. The cost effectiveness of service is reviewed in light of the operating expense per unlinked passenger trip. **Exhibits 9, 10,** and **11** reflect each of these indicators from 1985 to 1994 for each mode.

Exhibit 9 shows that the operating expense per vehicle revenue mile increased from 1993 to 1994 for all modes. The overall increase was nearly 2 percent. Light rail and demand response were the modes with the greatest increases, with 5.9 and 4.5 percent, respectively. These two modes have the greatest expansion in service supplied in 1994 as a result of the implementation of new light rail systems and the expansion or start up of new demand response services for compliance with Americans with Disabilities Act (ADA) regulations. Heavy rail was the mode with the smallest increase in cost per revenue mile, at approximately 1 percent. The increases in operating expenses per vehicle revenue mile for bus and commuter rail were 3.7 and 3.9 percent, respectively.

Exhibit 9

Operating Expense Per Vehicle Revenue Mile by Mode
1985-1994

Year	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
1985	$4.11	$6.42	$4.38	$8.81	$1.71
1986	4.29	6.70	9.64	9.47	1.68
1987	4.50	6.83	10.29	9.53	1.86
1988	4.64	7.01	10.30	9.81	1.89
1989	4.84	7.22	10.87	10.21	2.12
1990	5.07	7.34	11.17	10.26	2.25
1991	5.37	7.56	10.99	10.89	2.38
1992	5.54	6.97	10.85	11.05	2.40
1993	5.39	7.26	10.23	11.67	2.22
1994	5.59	7.34	10.63	12.38	2.32

Upon examination of service efficiency as measured by the ratio between operating expenses and vehicle revenue miles during the 1985-1994 timeframe, the overall increase was 32 percent and the expansion in service supplied was 22 percent. The modes with the greatest increases during the 1985-1994 period are commuter rail, light rail, and demand response, with increases of 242, 40, and 136 percent, respectively. Commuter rail had sharp increases in operating expense per vehicle revenue mile from 1985 to 1990 and decreased from 1990 to 1993. The increases for light rail and demand response are explained mainly by a sharp increase in the number of new systems which began operation during the 1985-1994 timeframe.

One measure of service effectiveness is the ratio of unlinked passenger trips by vehicle revenue mile. **Exhibit 10** displays these data for the 1985-1994 timeframe. In the aggregate, the ratio for 1994 is identical to 1993. However, upon examination of each mode, only bus and demand response displayed decreases in service effectiveness in 1994. The ratio for rail modes increased in 1994, with light rail increasing nearly 22 percent. This increase indicates that in 1994 there was a recovery in the consumption of public transportation and that this recovery was concentrated in the largest urbanized areas (population of over 1 million) of the country where almost all rail modes are located.

Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode 1985-1994 **Exhibit 10**

Year	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
1985	3.72	5.17	1.65	8.22	0.26
1986	3.36	5.04	1.80	7.69	0.26
1987	3.20	5.07	1.83	7.29	0.26
1988	3.18	4.59	1.77	7.59	0.26
1989	3.21	4.95	1.73	7.86	0.24
1990	3.18	4.51	1.70	7.57	0.23
1991	3.11	4.26	1.64	6.90	0.23
1992	3.05	4.33	1.57	6.74	0.22
1993	2.94	4.05	1.58	6.97	0.21
1994	2.92	4.20	1.62	8.48	0.20

The service effectiveness for bus, as measured by unlinked passenger trips per vehicle revenue mile, remained stable in 1994, with a small decrease of 0.6 percent. This small decrease is explained by a decline in ridership for this mode in small-size and medium-size urbanized areas. Small-size urbanized areas are those with a population under 200,000 and medium-size urbanized areas are those with a population between 200,000 and 1 million. Light rail displayed the highest increase in service effectiveness in 1994, with an increase of nearly 22 percent compared with 1993. This increase is in part the result of a reporting change by Boston. With this fact taken into account, an increase of nearly 4 percent in the service effectiveness of heavy rail (despite the reporting change by Boston) is the most striking fact in the consumption of public transportation in 1994. Demand response experienced a decrease in service effectiveness in 1994, which has been the

trend for this mode for the past 5 years. The reason for this decrease is that, year after year, the demand for this service increases, but the levels of output needed to meet demand increase at a higher rate. This situation results in a reduction in the effectiveness of the service. As expected, the rate of reduction in the effectiveness of demand response is stable. There is an almost perfect linear relationship between service supplied and service consumed for demand response. Other modes do not show this data behavior, because the service supplied is independent of random fluctuations in ridership for these other modes.

Exhibit 10 shows the seemingly higher service effectiveness for heavy rail and light rail compared with the other modes. However, the nature of the service for each mode must be considered. Heavy and light rail systems are designed to operate within corridors with high population densities and are served by feeder bus services and park-and-ride facilities to increase capture areas of potential riders. These two modes carry more ridership per vehicle revenue mile based on their design as higher capacity modes. Light rail displayed a greater service effectiveness than heavy rail. This is due, in part, to the greater average trip length of heavy rail in connection with the high levels of service supplied for this mode. Commuter rail usually links areas of attraction separated by long distances and has its ridership concentrated during peak hours, which is reflected in its high peak-to-base ratio. The combination of these factors results in a much smaller ratio of unlinked passenger trips per revenue mile for commuter rail compared with light rail and heavy rail.

Bus reflects a more moderate utilization, because bus services are provided on routes through highly dense areas of transit-dependent markets and operate during peak hours of ridership. In addition, bus services are also provided during off-peak hours in less densely populated areas. Thus, in the aggregate, the combination of high and low effective routes results in the moderate service effectiveness of bus. Demand response is designed to have much lower capacity and a greater flexibility and convenience for the user. Thus, demand response displays lower ridership along with significant miles of operation.

Demand response has shown a trend of consistent increases in ridership from 1985 to 1994. Revenue miles also show an increasing trend but at a much higher rate than ridership due to the nature of the service and the low capacity of demand response services. As a result, demand response has decreased service effectiveness. For demand response, which has poor cost and service effectiveness compared with other high capacity modes, an increase in the demand for service would require more financial assistance from the public sector or would require fare increases to cover an increasing operating deficit.

Operating expense per unlinked passenger trip is a measure of cost effectiveness made by assessing the relationship of the cost of providing a service to the service's use. As seen in **Exhibit 11**, heavy rail and light rail operating expense per unlinked passenger trip decreased while increasing for other modes in 1994. Heavy rail and light rail experienced decreases of 2.2 and 13 percent, respectively, in relation to 1993. As expected, the highest increase occurred for demand response, with an increase in cost effectiveness of 12.9 percent compared with 1993.

Operating Expense Per Unlinked Passenger Trip by Mode 1985-1994

Exhibit 11

Year	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
1985	$1.11	$1.24	$2.66	$1.07	$6.49
1986	1.28	1.33	5.36	1.23	6.45
1987	1.40	1.35	5.62	1.31	7.23
1988	1.46	1.53	5.81	1.29	7.38
1989	1.51	1.46	6.27	1.30	8.79
1990	1.59	1.63	6.57	1.36	9.71
1991	1.73	1.77	6.72	1.58	10.44
1992	1.82	1.61	6.92	1.64	11.03
1993	1.84	1.79	6.48	1.68	10.38
1994	1.91	1.75	6.57	1.46	11.73

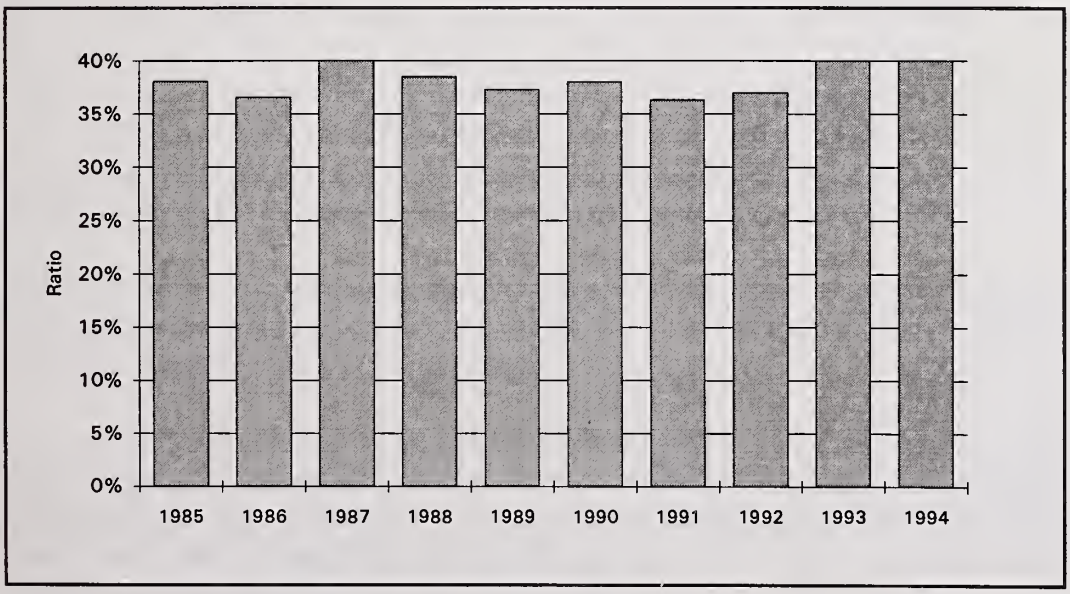
For the 1985-1994 timeframe, the modes with the highest increases in cost effectiveness are commuter rail, with an increase of 247 percent, and demand response, with an increase of 80.6 percent. For demand response, the trend indicates an increase in service consumed over the last 10 years. The smallest increases are found in heavy rail and light rail, with 41.1 and 36.4 percent, respectively.

Ratio of Passenger Fare Revenue to Operating Expense and Passenger Fare Revenue Per Unlinked Trip

The ratios of passenger fare revenue to operating expense and passenger fare revenue per unlinked trip are presented in **Exhibits 12** and **13**, respectively, and are aggregated for all modes from 1985 to 1994. The ratio of passenger fare revenue to operating expenses, also known as the recovery ratio, has remained stable since 1985, ranging between 35 and 40 percent. The ratio for 1994 is 39.6 percent, slightly greater than the 39.5 percent observed in 1993. There has been a trend of small but steady increases in the working ratio for the last 4 years.

Ratio of Passenger Fare Revenue to Operating Expense 1985-1994

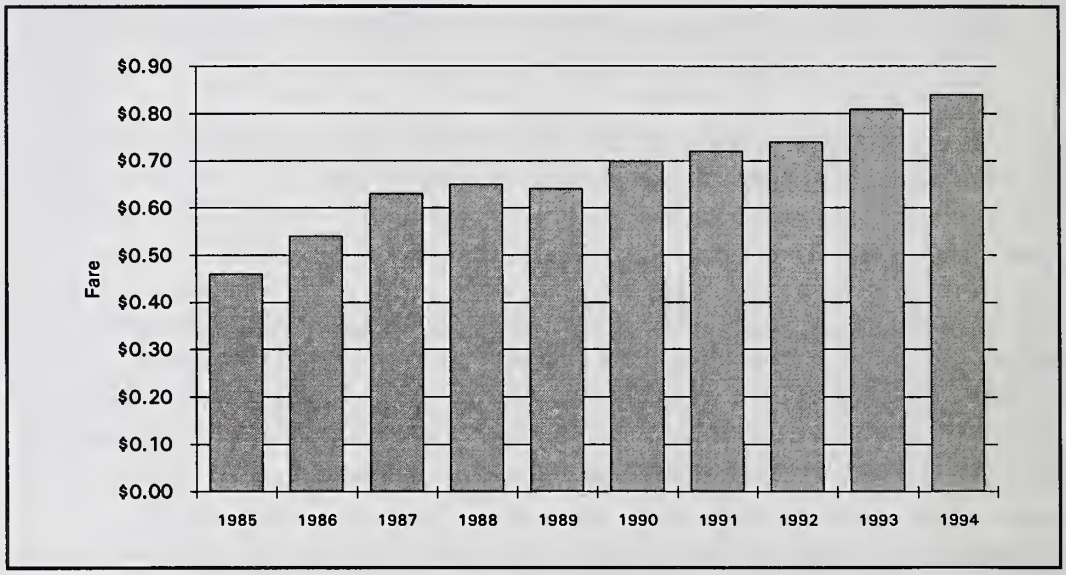
Exhibit 12



Passenger fare revenue in 1994 was $.84 per unlinked passenger trip, which represents an increase of 3.7 percent over 1993. During the 1985-1994 period, passenger fare revenue per unlinked passenger trip increased 82.6 percent.

Exhibit 13

Passenger Fare Revenue Per Unlinked Passenger Trip
1985-1994



Chapter 2
Key Modal Characteristics of Transit Agencies

Introduction

The exhibits and discussion in this chapter provide data on operations, performance, and other significant characteristics of the 15 largest bus and demand response transit agencies and for all transit agencies operating heavy rail, commuter rail, light rail, trolleybus, ferryboat, and automated guideway systems. One change introduced this year in this chapter is related to purchased transportation data. In previous years, the exhibits in this chapter displayed data from individual transit agencies which included the directly operated component of the service and the purchased transportation data reported by the individual transit agency. In previous years, agencies that had part of their service supplied by private providers filing their own National Transit Database (NTD) report did not have that component of the service included in the exhibits, because the purpose of this chapter was to provide data for individual reporters. In 1994, all purchased transportation data are included and a full characterization of a transit system's mode is provided.

The change implemented for the 1994 edition of the *National Transit Summaries and Trends (NTST)* affects only three modes: bus, demand response, and commuter rail. For bus, New Jersey Transit, New York City Department of Transportation, and Dallas DART are agencies for which the data are an aggregation of their reports and the reports of their providers filing separately. Demand response has private providers filing separately for the following agencies: Port Authority of Allegheny County (Pittsburgh), Metro Dade Transit Agency (Miami), and Pace, Suburban Bus Division (Suburban Chicago). For commuter rail, the private providers, Burlington Northern Railroad and Chicago & Northwestern Railroad, are aggregated with the data provided by the buyer of their services which is the Northeastern Illinois Regional Commuter Railroad Corporation, known as Metra.

Operating expenses for purchased transportation are the expenses incurred by the buyer of the service (object classes 508.1 and 508.2). For more information about purchased transportation, refer to the *NTST* Introduction.

Chapter Organization

Three exhibits are presented for each of the following modes: bus, heavy rail, commuter rail, light rail, and demand response. Information concerning trolleybus, ferryboat, and automated guideway systems is also presented because these modes are the predominant ones in the "other" category. **Exhibits 14 through 37** provide data concerning service, performance indicators, and infrastructure for each mode.

It should be noted that performance indicators are given for agencies without indication of the ratios for the public and private component of their services, which may lead to incorrect assumptions about the efficiency of the public and private sectors in the transit industry.

Bus Agencies

As can be derived from **Exhibit 14**, the "public generated" (the service directly supplied by a public transit agency) component of the bus service is less "efficient" than the private one for all agencies belonging to the top 15 bus providers. However, as mentioned before, the participation of private providers in the total service supplied by these agencies is small, with few exceptions. In addition, an analysis of the cost per mile for the private component of the service supplied for these 15 bus agencies reveals that there is a strong statistical correlation between the service efficiency of private providers and their percentile participation in the total supply of transit service. As their participation increases, private providers service efficiency decreases or the cost per revenue mile for private providers increases substantially as the ratio of private service supplied/total service supplied increases. Since the majority of bus transit systems have minimal participation from private providers and since the service efficiency tends to be higher for those providers supplying small portions of the service, the overall efficiency of the private providers would be artificially high.

Exhibit 14

Key Bus Operating Characteristics of Transit Agencies
1994

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Mile (000s)	Vehicle Revenue Hour (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-LACMTA	DO	$629,315.7	81,548.2	5,775.3	378,640.3	1,179.6	1,409,683.8
		PT	3,407.2	1,406.2	68.8	1,098.0	3.7	9,412.7
	Total		632,722.9	82,954.4	6,844.1	379,738.2	1,183.3	1,419,096.5
CO	Denver-RTO	DO	107,175.1	19,905.0	1,184.1	53,628.4	182.7	201,277.0
		PT	22,718.4	6,263.3	422.5	7,848.4	25.7	29,759.0
	Total		129,893.6	26,168.4	1,606.6	61,476.8	208.4	231,046.0
OC	Washington-WMATA	DO	286,361.2	36,654.9	3,266.1	144,386.4	490.8	450,913.1
IL	Chicago RTA-CTA	OO	516,664.6	72,666.2	8,960.7	331,520.7	1,049.5	766,065.0
MA	Boston-M6TA	DO	207,213.9	21,956.4	1,903.2	97,558.2	320.8	232,216.4
		PT	6,669.8	2,492.0	138.0	2,113.6	7.6	38,681.9
	Total		213,883.7	24,448.4	2,041.2	99,671.8	328.3	270,898.3
MD	Baltimore-Merylend-MTA	DO	124,753.2	18,398.4	1,654.3	83,846.6	279.7	249,018.4
		PT	6,232.5	1,634.0	67.0	1,287.4	4.9	31,720.2
	Total		130,985.7	20,032.4	1,721.3	85,134.0	284.6	280,738.6
MN	Minneapolis- St. Peul-MCTO	DO	130,313.0	24,436.4	1,733.9	65,466.9	220.2	262,585.9
		PT	539.6	107.6	6.3	95.1	0.4	338.0
	Total		130,852.6	24,544.0	1,740.3	65,562.0	220.6	262,923.8
NJ	New Jersey Transit	DO	378,517.3	64,098.1	4,219.3	122,307.4	417.4	716,881.1
		PT	155,596.3	46,076.5	2,495.0	61,779.5	230.3	771,638.4
	Total		534,113.6	110,174.6	6,714.4	184,086.9	647.7	1,490,519.5
NY	NY-MTA-NYCTA	OO	1,046,143.6	89,672.4	11,369.7	605,751.6	1,965.9	1,156,934.0
NY	New York City OOT	PT	216,664.6	22,192.1	2,225.1	110,907.4	369.7	409,756.9
PA	Philedelphia-SEPTA	DO	269,394.1	34,612.4	3,406.6	163,190.4	536.2	471,189.3
PA	Pittsburgh-PAT	OO	141,637.3	23,853.5	1,843.1	64,811.1	219.1	266,764.6
TX	Dallas-DART	DO	111,443.6	18,426.8	1,293.5	44,911.6	157.0	162,763.0
		PT	25,505.4	7,696.6	404.2	8,536.8	32.9	74,291.2
	Total		136,949.0	26,123.4	1,697.6	53,448.3	189.9	237,054.2
TX	Houston-Metro	DO	171,077.6	34,431.5	2,333.9	81,447.6	275.3	444,111.3
		PT	6,197.5	1,603.6	60.9	1,524.4	6.0	27,551.8
	Total		177,275.1	36,035.1	2,394.8	82,972.0	281.2	471,663.2
WA	Seattle-Metro	DO	176,286.1	26,076.2	1,543.6	56,205.4	191.9	380,340.6
		PT	2,828.4	1,099.8	71.7	601.5	2.0	3,641.3
	Total		179,114.5	27,176.0	1,615.3	56,806.9	193.9	383,981.8
		DO Total	$4,318,296.6	566,956.4	49,549.5	2,293,672.7	7,487.7	7,186,743.6
		PT Total	$448,359.9	90,571.7	5,959.7	195,791.9	683.2	1,396,803.4
		Total	$4,766,656.4	657,528.2	55,509.2	2,489,464.6	8,170.9	8,583,547.0
		Percent of DO Bus	53.46	40.73	44.81	53.70	52.95	48.68
		Percent of PT Bus	57.33	48.69	47.90	54.64	55.09	57.93
		Percent of National Total	53.80	41.46	45.12	53.78	53.13	49.98

The data indicate that, in addition to the secondary role of private providers for the top 15 bus transit systems, the routes served by the top 15 have a commuter orientation, longer trip lengths, and higher average speeds.

As demonstrated in **Exhibit 15**, 3.79 unlinked passenger trips per vehicle revenue mile are realized on average by the combination of the top 15 bus systems, compared with 2.92 for all bus agencies. However, it should be noted that only 8 of the top 15 agencies demonstrate greater unlinked passenger trips per vehicle revenue mile than the 2.92 average for all bus agencies.

Exhibit 15 also reflects the low service efficiency of these 15 bus agencies. In terms of operating expense per vehicle revenue mile and per vehicle revenue hour, these agencies attained figures of $7.25 and $85.87, respectively, compared with $5.59 per vehicle revenue mile and $72.01 per vehicle revenue hour for all bus agencies. Only 5 of the 15 agencies posted figures that were less than the national average. In terms of operating expense per unlinked passenger trip and operating expense per passenger mile, these 15 agencies averaged $1.91 and $0.55, respectively. Nationally, the average figures for bus are $1.91 and $0.52. Thus, in terms of cost effectiveness, these 15 agencies are more in line with the national average for bus.

Exhibit 15

Key Bus Performance Indicators of Transit Agencies
1994

ST	Agency Name	Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-LACMTA	$7.63	$92.45	$1.67	$0.45	4.58	55.48	207.34	12.12
CO	Denver-RTD	4.96	80.85	2.11	0.56	2.35	38.27	143.81	16.29
DC	Weshington-WMATA	7.87	87.70	2.00	0.64	3.94	43.91	137.13	11.15
IL	Chicego-RTA-CTA	7.11	74.01	1.56	0.66	4.56	47.49	112.61	10.41
MA	Boston-MBTA	8.75	104.78	2.15	0.79	4.08	48.83	132.71	11.98
MD	Beltimore-Merylend-MTA	6.54	76.10	1.54	0.47	4.25	49.46	163.10	11.64
MN	Minneepolis-St. Peul-MCTO	5.33	75.19	2.00	0.50	2.67	37.67	151.08	14.10
NJ	New Jersey Trensit	4.85	79.54	2.90	0.36	1.67	27.42	222.00	16.41
NY	NY-MTA-NYCTA	11.67	91.85	1.73	0.90	6.76	53.18	101.75	7.87
NY	New York City DOT	9.85	98.27	1.97	0.53	5.00	49.84	184.15	9.97
PA	Philadelphie-SEPTA	8.31	84.95	1.77	0.61	4.69	47.90	138.31	10.22
PA	Pittsburgh-PAT	5.94	76.85	2.19	0.53	2.72	35.16	145.82	12.94
TX	Dellas-DART	5.24	80.67	2.56	0.58	2.05	31.48	139.64	15.39
TX	Houston-Metro	4.92	74.03	2.14	0.38	2.30	34.65	196.95	15.05
WA	Seettle-Metro	6.59	110.89	3.15	0.47	2.09	35.17	237.72	16.82
	Average of Agencies	$7.25	$85.87	$1.91	$0.55	3.79	44.85	154.81	11.85
	National Average for Bus Mode	$5.59	$72.01	$1.91	$0.52	2.92	37.63	139.71	12.89

Exhibit 16 indicates that the majority of the 15 agencies have at least some exclusive or shared rights-of-way for their bus operations, with 8 of the systems having more than 20 directional route miles of such rights-of-way. Data in this exhibit reflect fixed guideway operated by each bus transit agency. In many larger metropolitan areas, several bus agencies operate on the same fixed guideway segments. **Exhibit 60** provides data on the actual segments operated by the 15 top bus agencies. These 15 agencies also account for over 40 percent of the buses operated in maximum service.

Exhibit 16

Key Bus Infrastructure Characteristics of Transit Agencies 1994

ST	Agency Neme	Fixed Guidewey Directional Route Miles	Directional Route Miles Exclusive ROW	Directional Route Miles Controlled ROW	Vehicles Opereted in Meximum Service	Vehicles Aveileble for Meximum Service	Averege Fleet Age
CA	LA-LACMTA	24.5	24.5	0.0	1,948	2,357	8.2
CO	Denver-RTD	22.4	9.9	12.5	685	828	5.7
DC	Washington-WMATA	45.9	0.0	45.9	1,294	1,454	12.7
IL	Chicego-RTA-CTA	5.4	5.4	0.0	1,729	2,079	8.6
MA	Boston-MBTA	1.5	1.5	0.0	822	1,099	11.1
MD	Beltimore-Merylend-MTA	11.8	0.0	11.8	711	892	7.5
MN	Minneapolis-St. Paul-MCTO	90.4	24.9	65.5	860	999	5.8
NJ	New Jersey Trensit	6.7	0.0	6.7	2,669	3,223	10.1
NY	NY-MTA-NYCTA	38.8	2.6	36.2	3,153	3,717	9.0
NY	New York City DOT	0.0	0.0	0.0	922	1,137	7.6
PA	Philedelphie-SEPTA	3.6	2.5	1.1	1,120	1,441	9.9
PA	Pittsburgh-PAT	41.3	41.3	0.0	733	850	6.4
TX	Dellas-DART	17.8	8.5	9.3	735	871	9.5
TX	Houston-Metro	131.4	127.4	4.0	991	1,291	6.7
WA	Seettle-Metro	124.3	118.9	5.4	844	1,020	10.7
	Individual Agencies Total	565.8	367.4	198.4	19,216	23,258	
	Weighted Average						7.3
	Total Bus Mode	958.7	493.7	465.0	43,723	53,720	
	Weighted Average						8.5

Heavy Rail Agencies

The heavy rail agencies noted here are the total number of heavy rail operators in the United States providing a combined total of 8,277 vehicles in maximum service. The dominance of three New York City metropolitan area agencies is demonstrated by the data presented. These agencies are the New York City Transit Authority, Staten Island Rapid Transit Operating Authority, and the Port Authority Trans-Hudson Corporation. **Exhibit 17** shows that 64 percent of the heavy rail operating expenses realized in the United States in 1994 are accounted for by these New York City agencies, which also provided 61 percent of the heavy rail vehicle revenue miles operated, accounted for 69 percent of the heavy rail vehicle revenue hours operated, realized 58 percent of heavy rail passenger miles, and carried 64 percent of all heavy rail riders.

Exhibit 17

Key Heavy Rail Operating Characteristics of Transit Agencies 1994

ST	Agency Neme	Type of Service	Opereting Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekdey Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-LACMTA	DO	$21,487.5	625.0	43.2	4,971.5	15.8	7,469.4
CA	Sen Frencisco -BART	DO	210,514.4	43,054.2	1,204.1	77,530.2	261.8	915,990.6
DC	Washington-WMATA	DO	334,748.8	40,202.4	1,525.7	195,832.6	679.2	1,064,952.1
FL	Miami-MDTA	DO	47,595.1	5,522.1	223.2	14,328.7	47.8	113,675.3
GA	Atlante-MARTA	DO	74,755.1	20,853.5	801.7	69,855.0	224.1	378,370.4
IL	Chicago-RTA-CTA	DO	299,381.1	45,744.7	1,907.8	143,579.1	485.2	908,569.1
MA	Boston-MBTA	DO	180,676.2	19,835.4	901.6	162,673.0	501.7	494,526.0
MD	Baltimore-MDOT	DO	32,951.9	3,656.4	142.3	10,469.8	37.1	54,890.5
NY	NY-MTA-NYCTA	DO	2,243,405.8	300,167.3	16,480.3	1,308,429.9	4,280.7	5,845,434.3
NY	NY-MTA-Staten Island	DO	18,634.7	1,886.5	89.1	5,150.1	19.2	37,750.8
NY	Port Authority-PATH	DO	155,877.0	12,797.5	634.5	64,608.2	222.9	281,567.4
OH	Clevelend-RTA	DO	19,595.4	1,909.9	73.5	6,907.6	23.5	52,986.1
PA	Philadelphie-PATCO	DO	26,979.9	4,270.5	147.3	11,133.8	40.1	97,580.1
PA	Philadelphia-SEPTA	DO	119,560.1	15,518.4	783.6	93,891.2	319.4	414,263.3
	Totel		$3,786,162.8	516,043.8	24,957.8	2,169,358.8	7,158.6	10,668,025.4

As seen in **Exhibit 18**, 6 of the reporting transit agencies exceed the average of 4.20 unlinked passenger trips per vehicle revenue mile and 7 exceed the average of 86.92 unlinked passenger trips per vehicle revenue hour. This is reflective of a high level of service effectiveness for these operators.

Exhibit 18 also offers insight into the relative service efficiency and cost effectiveness of these agencies. Four agencies had operating expenses per vehicle revenue mile of less than the $7.34 national average, and 2 realized operating expenses per vehicle revenue hour of less than the $151.70 national average. Five agencies also posted operating expenses per unlinked passenger trip that were lower than the national average of $1.75. Six agencies were equal to or less than the $0.35 national average for operating expenses per passenger mile.

Exhibit 18

Key Heavy Rail Performance Indicators of Transit Agencies 1994

ST	Agency Name	Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-LACMTA	$34.38	$497.51	$4.32	$2.88	7.95	115.11	172.94	14.47
CA	San Francisco -BART	4.89	174.83	2.72	0.23	1.80	64.39	760.70	35.76
DC	Washington-WMATA	8.33	219.41	1.71	0.31	4.87	128.36	698.01	26.35
FL	Miami-MDTA	8.62	213.25	3.32	0.42	2.59	64.20	509.33	24.74
GA	Atlante-MARTA	3.58	93.24	1.07	0.20	3.35	87.13	471.96	26.01
IL	Chicago-RTA-CTA	6.54	156.93	2.09	0.33	3.14	75.26	476.24	23.98
MA	Boston-MBTA	9.11	200.39	1.11	0.37	8.20	180.43	548.49	22.00
MD	Baltimore-MDOT	9.01	231.62	3.15	0.60	2.86	73.59	385.83	25.70
NY	NY-MTA-NYCTA	7.47	136.13	1.71	0.38	4.36	79.39	354.69	18.21
NY	NY-MTA-Staten Island	9.88	209.24	3.62	0.49	2.73	57.83	423.88	21.18
NY	Port Authority-PATH	12.18	245.68	2.41	0.55	5.05	101.83	443.79	20.17
OH	Clevelend-RTA	10.26	266.75	2.84	0.37	3.62	94.03	721.29	26.00
PA	Philadelphia-PATCO	6.32	183.21	2.42	0.28	2.61	75.61	662.64	29.00
PA	Philedelphia-SEPTA	7.70	152.57	1.27	0.29	6.05	119.82	528.65	19.80
	Average	$7.34	$151.70	$1.75	$0.35	4.20	86.92	427.44	20.70

Exhibit 19 also reflects the dominance of the New York City agencies. Nearly 38 percent of heavy rail route miles are accounted for by the New York City area and 44 percent of heavy rail track miles are located there. Nearly 51 percent of all heavy rail stations are served by the three New York City agencies. Nearly 64 percent of heavy rail vehicles operated in maximum service and 60 percent of heavy rail vehicles available for service are accounted for by the three New York City agencies.

Exhibit 19

Key Heavy Rail Infrastructure Characteristics of Transit Agencies 1994

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-LACMTA	6.0	8.8	5	5	16	30	3.0
CA	San Francisco -BART	142.0	196.5	34	34	406	589	16.7
DC	Washington-WMATA	178.2	192.0	74	74	588	764	11.2
FL	Miami-MDTA	42.2	53.2	21	0	76	136	12.0
GA	Atlanta-MARTA	80.8	99.2	33	33	238	238	10.9
IL	Chicago-RTA-CTA	207.7	289.2	145	0	804	1,230	11.6
MA	Boston-MBTA	75.8	107.7	53	33	406	432	16.8
MD	Baltimore-MDOT	26.6	31.6	12	12	48	100	9.4
NY	NY-MTA-NYCTA	492.9	834.2	469	25	4,948	5,803	21.5
NY	NY-MTA-Staten Island	28.6	32.5	22	2	36	64	23.0
NY	Port Authority-PATH	28.6	43.1	13	6	282	342	21.8
OH	Cleveland-RTA	38.2	41.9	18	1	35	60	11.0
PA	Philadelphia-PATCO	31.5	38.4	13	2	102	121	21.4
PA	Philadelphia-SEPTA	76.1	102.3	76	4	292	373	25.1
	Total	1,455.2	2,070.6	988	231	8,277	10,282	
	Weighted Average							18.6

Commuter Rail Agencies

Exhibits 20, **21**, and **22** present all 16 commuter rail systems, encompassing 19 individual agencies. Once again, this mode is dominated by two agencies primarily serving the New York City metropolitan area, one serving New Jersey, and one serving the Chicago metropolitan area. As shown in **Exhibit 20**, the systems serving the metropolitan areas of New York-New Jersey and Chicago accounted for 80.7 percent of the total operating expenses for commuter rail systems, 78 percent of the vehicle revenue miles, 77 percent of the vehicle revenue hours, 80.5 percent of the unlinked passenger trips, and 82.5 percent of the passenger miles. Therefore, three individual agencies and one commuter rail system (Chicago) are responsible for over 77 percent of service supplied and consumed for commuter rail in the nation.

Exhibit 20

Key Commuter Rail Operating Characteristics of Transit Agencies 1994

ST	Agency Name	Service	Opereting Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-OCTA	PT	$1,206.5	86.8	2.2	137.6	0.7	5,640.2
CA	LA-SCRRA	PT	42,484.0	3,124.6	77.9	3,291.2	12.9	109,511.8
CA	SF-CALTRANS	PT	39,572.9	3,378.1	112.3	5,607.2	19.2	127,285.5
CT	Hertford-Conn DOT	PT	5,865.2	445.6	10.6	288.7	1.1	5,826.6
FL	Ft. Lauderdale-TCRA	PT	20,888.2	2,451.5	60.9	2,912.9	9.7	96,504.1
IL	Chicago-RTA-Metra	DO	179,424.0	14,474.3	460.6	30,059.5	113.4	622,513.6
		PT	130,275.7	17,015.8	509.5	35,812.0	133.4	777,575.3
	Total		309,699.7	31,490.1	970.1	65,871.5	246.8	1,400,088.9
IN	NW IN-NICTD	DO	20,862.0	2,038.2	58.1	2,588.0	9.3	72,401.4
MA	Boston-MBTA	DO	100,010.0	15,988.7	530.5	23,280.1	83.9	431,390.3
MD	Baltimore-Maryland-MTA	PT	32,414.3	5,928.0	117.6	5,052.4	19.6	152,077.4
NJ	New Jersey Transit	DO	330,142.0	38,146.0	1,075.8	46,274.9	161.1	1,035,303.4
		PT	7,826.9	1,395.9	26.2	1,343.1	5.3	51,066.3
	Total		337,967.9	39,541.9	1,102.0	47,618.0	166.4	1,086,369.7
NY	NY-MTA-Long Island RR	DO	662,423.5	54,380.1	1,714.8	97,393.0	343.0	2,272,185.6
NY	NY-MTA-Metro North RR	DO	488,496.4	37,936.8	990.2	62,140.6	215.8	1,843,609.0
PA	Philedelphia-Penn DOT	PT	1,237.7	198.5	3.9	47.4	0.3	2,979.6
PA	Philadelphie-SEPTA	DO	152,846.9	11,574.0	420.8	20,926.2	73.7	330,597.8
VA	VA-VRE	PT	11,818.0	960.9	27.4	1,798.4	7.2	59,443.1
		DO Total	$1,934,204.9	174,547.9	5,313.7	282,662.3	1,000.2	6,608,001.0
		PT Total	$293,588.3	34,985.7	885.5	56,290.8	209.3	1,387,909.9
		Total	$2,227,793.2	209,533.6	6,199.2	338,953.0	1,209.4	7,995,910.9

The participation of the private sector in the generation of commuter rail service is small, following a trend that can be found in all transit modes, with the exception of demand response. In 1994, contracting commuter rail services totalled 13.1 percent of the total operating expense for this mode. Particularly noteworthy is the fact that commuter rail is the mode with the largest share of service provided through contracting after demand response. It occupies first place among mass transit modes. Ten of the 16 commuter rail systems have the entire or part of their service provided through purchased transportation. In most of the cases, private providers are freight rail companies that have retained the ownership of the facilities and/or rolling stock. AMTRAK also has an important role as the provider for agencies such as Boston, MARC Services-Maryland, SCCRA, and VRE Virginia. AMTRAK's role is reflected as purchased transportation service within the four operating expense functions (vehicle operations, vehicle maintenance, non-vehicle maintenance, and general administration).

Performance indicators for commuter rail are displayed in **Exhibit 21**. The cost per revenue mile for commuter rail systems varies from $5.47 per revenue mile to $13.90 per revenue mile. The two largest operators of commuter rail are both located in the New York City metropolitan area (Long Island Rail Road and Metro North) and show a cost per mile higher than the national average (14.5 percent and 21.16 percent, respectively). The long trip lengths and ridership that is highly concentrated during peak hours are the main reasons for the discrepancy between the cost effectiveness of commuter rail based on unlinked passenger trips and passenger miles. The cost per passenger mile is on average much smaller than the cost per unlinked passenger trips due to the long trip lengths of commuter rail.

Maryland-MTA (MARC Services) was the most cost effective system in 1994 in terms of expenses per passenger miles, while Boston was the most cost effective in terms of expenses per unlinked passenger trip. The service effectiveness of commuter rail as measured by unlinked passenger trips per vehicle revenue mile is poor compared with other

Key Commuter Rail Performance Indicators of Transit Agencies 1994 **Exhibit 21**

ST	Agency Name	Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-OCTA	$13.60	$545.58	$12.91	$0.39	1.05	42.27	1,406.34	40.12
CA	LA-SCRRA	13.90	538.59	8.77	0.21	1.59	61.30	2,517.95	38.74
CA	SF-CALTRANS	11.71	352.35	7.06	0.31	1.66	49.93	1,133.34	30.08
CT	Hartford-Conn DOT	13.16	556.21	20.32	1.01	0.85	27.38	552.28	42.24
FL	Ft. Lauderdale-TCRA	8.52	342.89	7.17	0.22	1.19	47.82	1,584.11	40.24
IL	Chicago-RTA-Metra	9.83	319.25	4.70	0.22	2.09	87.90	1,443.29	32.48
IN	NW IN-NICTD	10.24	359.36	8.06	0.29	1.27	44.58	1,247.20	35.11
MA	Boston-MBTA	6.25	188.51	4.29	0.23	1.48	43.88	813.15	30.14
MD	Baltimore-Maryland-MTA	5.47	275.61	6.42	0.21	0.85	42.96	1,293.06	50.40
NJ	New Jersey Transit	8.55	306.68	7.10	0.31	1.20	43.21	985.82	35.88
NY	NY-MTA-Long Island RR	12.18	386.30	6.80	0.29	1.79	56.80	1,325.04	31.71
NY	NY-MTA-Metro North RR	12.88	493.33	7.86	0.26	1.64	62.76	1,861.85	38.31
PA	Philadelphia-Penn DOT	6.23	317.53	26.13	0.42	0.24	12.15	764.00	50.91
PA	Philadelphia-SEPTA	13.21	363.24	7.30	0.46	1.81	49.73	785.88	27.50
VA	VA-VRE	12.30	432.09	6.57	0.20	1.87	65.75	2,173.42	35.13
	Average	$10.63	$359.37	$6.57	$0.28	1.62	54.68	1,289.83	33.80

modes, but this is not an indication of low utilization of the service. The main reason for the low service effectiveness of commuter rail is related to the concentration of ridership during peak hours combined with the long distances travelled by commuters.

Exhibit 22 also demonstrates the dominance of New York City agencies, as well as New Jersey and Chicago, relative to infrastructure. Commuter rail systems serving those areas account for 75 percent of the vehicles operated in maximum service, 50 percent of the fixed guideway directional route miles, and 57 percent of the commuter rail stations.

Exhibit 22

Key Commuter Rail Infrastructure Characteristics of Transit Agencies 1994

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated for Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-OCTA	N/A	N/A	N/A	N/A	5	5	N/A
CA	LA-SCRRA	668.4	460.2	38	38	125	146	1.7
CA	SF-CALTRANS	153.6	153.6	34	0	90	93	8.9
CT	Hartford-Conn DOT	65.6	68.3	7	7	13	25	27.3
FL	Ft. Lauderdale-TCRA	132.8	136.1	15	15	25	31	5.3
IL	Chicago-RTA-Metra	864.4	1,104.6	216	59	952	1,039	18.9
IN	NW IN-NICTD	138.4	89.0	18	7	45	56	8.7
MA	Boston-MBTA	529.8	460.3	101	49	291	346	6.4
MD	Baltimore-Maryland-MTA	373.4	455.1	39	0	107	129	22.6
NJ	New Jersey Transit	1,171.6	1,177.3	163	27	691	825	17.8
NY	NY-MTA-Long Island RR	638.2	701.1	134	15	976	1,184	23.2
NY	NY-MTA-Metro North RR	535.4	751.0	107	0	696	792	19.0
PA	Philadelphia-Penn DOT	144.0	144.0	14	4	12	41	42.1
PA	Philadelphia-SEPTA	442.8	694.8	181	25	267	343	19.6
VA	VA-VRE	175.0	190.0	16	16	54	71	18.5
	Total	6,033.4	6,585	1,083	262	4,349	5,126	
	Weighted Average							19.2

Light Rail Agencies

Also significant is the commuter rail infrastructure of the Northeastern Illinois Regional Commuter Railroad Corporation (Metra) and its purchased transportation providers (Burlington Northern Railroad and Chicago & Northwestern Transportation Company); Southeastern Pennsylvania Transportation Authority (SEPTA); and the Massachusetts Bay Transportation Authority (MBTA).

Exhibits 23, **24**, and **25** provide data for all 19 reporting light rail operators. It should be noted that two new start agencies (St. Louis and Denver) were added for 1994.

Exhibit 23 demonstrates that five agencies, Massachusetts Bay Transportation Authority (MBTA) in Boston, Southeastern Pennsylvania Transportation Authority (SEPTA) in Philadelphia, San Francisco Municipal Railway (Muni), Los Angeles County Metropolitan Transportation Authority (LACMTA) in Los Angeles, and the San Diego Trolley, dominate service consumed statistics. These agencies reported over 70 percent of the unlinked passenger trips made via light rail and realized 64 percent of the accumulated passenger miles.

In terms of service supplied, these five agencies also accounted for a majority of vehicle revenue miles and hours. Combined, they reported over 59 percent of the vehicle revenue miles and 60.5 percent of vehicle revenue hours.

Key Light Rail Operating Characteristics of Transit Agencies 1994

Exhibit 23

ST	Agency Nsme	Type of Service	Opersting Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Houre (000s)	Unlinked Peesenger Trips (000s)	Average Weekdsy Unlinked Passenger Trips (000s)	Pessenger Miles (000s)
CA	LA-LACMTA	DO	$43,943.5	2,944.0	152.3	11,648.8	36.6	103,122.2
CA	Sscremento-RT	DO	15,438.7	1,775.5	96.5	8,958.3	23.3	33,267.5
CA	Sen Diego-The Trolley	DO	19,337.3	4,175.7	220.3	14,888.0	42.8	75,819.7
CA	Ssn Frencisco-Muni	DO	62,830.7	3,821.6	342.0	37,615.5	125.8	102,170.5
CA	Ssn Jose-SCCTD	DO	21,177.4	1,715.2	114.8	8,133.0	19.7	29,501.1
CO	Denver-RTD	DO	3,678.8	109.4	8.8	964.6	12.7	2,633.3
LA	New Orlesns-RTA	DO	5,054.9	702.0	77.8	7,257.8	21.1	18,184.7
MA	Boston-M8TA	DO	94,954.3	5,529.2	368.6	108,509.4	336.3	151,913.2
MD	8altimore-Maryland-MTA	DO	17,438.1	2,215.8	129.8	6,229.1	20.4	40,838.8
MO	St. Louis-8i-State	DO	11,494.2	1,769.5	79.7	8,004.9	26.8	42,578.6
NJ	New Jersey Trensit	DO	6,027.7	664.1	43.3	3,812.7	13.0	11,878.8
NY	Buffalo-NFTA	DO	13,803.4	900.9	75.7	8,248.0	26.6	19,058.0
OH	Clevelend-RTA	DO	11,375.4	953.5	46.1	4,259.9	14.8	27,179.6
OR	Portlsnd-Tri-Met	DO	14,450.1	1,554.1	102.3	8,482.3	25.6	46,418.4
PA	Philedelphie-SEPTA	DO	40,758.3	2,613.4	315.8	40,054.3	130.9	91,833.6
PA	Pittsburgh-PAT	DO	27,471.4	1,650.5	103.3	7,943.3	27.2	35,758.2
TN	Memphis-MATA	DO	1,121.8	97.2	18.0	430.6	1.0	364.2
TX	Gslveston-Islsnd Trensit	DO	282.9	19.1	4.2	117.8	0.3	258.7
WA	Seattle-Metro	DO	1,168.9	48.3	11.4	437.5	1.4	443.7
	Total		$411,583.8	33,258.9	2,310.6	282,195.4	908.2	831,038.5

Measures of performance for light rail are provided in **Exhibit 24**. The agencies with the best service effectiveness, as measured by unlinked passenger trips per vehicle revenue miles, are Boston (MBTA), Philadelphia (SEPTA), San Francisco-Muni, and New Orleans. These agencies carry over 10 unlinked passenger trips per vehicle revenue mile. The national average is 8.5 unlinked passenger trips per vehicle revenue mile. The most efficient agencies (operating expense per vehicle revenue mile) are San Diego Trolley, St. Louis-Bi-State, New Orleans, and MARC Services-Maryland. These agencies display a cost per mile of less than $8 per revenue mile. The national average is $12.37 per revenue mile.

Key Light Rail Performance Indicators of Transit Agencies 1994

Exhibit 24

ST	Agency Neme	Opereting Expense				Pessenger Tripe		Pessenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Pessenger Trip (UPT)	Per Peesenger Mile (PM)	Per Vehicle Revenue Miie (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-LACMTA	$14.93	$288.59	$3.71	$0.43	4.02	77.82	677.25	19.33
CA	Secremento-RT	8.69	156.69	2.22	0.46	3.92	70.63	337.89	18.02
CA	San Diego-The Trolley	4.63	87.77	1.30	0.26	3.57	67.57	343.22	18.95
CA	Sen Francisco-Muni	17.35	183.70	1.67	0.61	10.39	109.98	298.73	10.59
CA	Sen Jose-SCCTD	12.35	184.49	3.45	0.72	3.58	53.43	257.01	14.94
CO	Denver-RTD	33.62	542.52	3.81	1.40	8.82	142.25	388.33	16.13
LA	New Orleens-RTA	7.20	64.98	0.70	0.31	10.34	93.30	208.05	9.02
MA	Boston-M8TA	17.17	257.60	0.88	0.63	19.62	294.37	412.12	15.00
MD	8eitimore-Meryiend-MTA	7.87	134.53	2.80	0.43	2.81	48.06	315.07	17.09
MO	St.Louis-8i-Stete	6.50	144.15	1.44	0.27	4.52	100.39	533.95	22.19
NJ	New Jersey Trsnsit	9.08	139.12	1.58	0.51	5.74	88.00	274.16	15.33
NY	8uffelo-NFTA	15.10	179.72	1.65	0.71	9.16	108.97	251.75	11.90
OH	Clevelend-RTA	11.93	246.92	2.67	0.42	4.47	92.47	589.96	20.70
OR	Portlsnd-Tri-Met	9.30	141.22	1.70	0.31	5.46	82.89	453.63	15.19
PA	Philedelphis-SEPTA	14.49	129.07	1.02	0.44	14.24	126.84	290.81	8.91
PA	Pittsburgh-PAT	16.64	265.84	3.46	0.77	4.81	76.87	346.03	15.97
TN	Memphie-MATA	11.54	62.50	2.61	3.08	4.43	23.99	20.29	5.41
TX	Galveston-lelend Trensit	13.75	62.23	2.24	1.02	6.15	27.84	61.24	4.53
WA	Seattle-Metro	24.15	102.46	2.67	2.63	9.05	38.41	38.95	4.24
	Average	$12.38	$178.13	$1.46	$0.50	8.48	122.13	359.67	14.39

Exhibit 25 shows that the same five agencies mentioned above accounted for 61.5 percent of the vehicles operated in maximum service, over 47 percent of the light rail stations, and 46.2 percent of the directional route miles.

Exhibit 25

Key Light Rail Infrastructure Characteristics of Transit Agencies 1994

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-LACMTA	43.2	46.7	22	22	36	54	5.0
CA	Sacramento-RT	36.2	34.0	28	0	32	36	5.9
CA	San Diego-The Trolley	41.5	41.5	35	35	59	71	8.1
CA	San Francisco-Muni	49.7	54.2	9	9	101	128	20.6
CA	San Jose-SCCTD	39.0	41.1	33	5	32	54	12.0
CO	Denver-RTD	10.6	12.7	15	15	10	11	1.0
LA	New Orleans-RTA	16.0	12.7	2	0	22	44	69.9
MA	Boston-MBTA	55.9	77.5	95	0	177	209	13.7
MD	Baltimore-Marylend-MTA	43.6	35.3	24	24	30	35	2.0
MO	St. Louis-Bi-State	28.0	30.4	17	17	26	31	1.3
NJ	New Jersey Transit	8.3	8.3	11	0	16	22	27.5
NY	Buffalo-NFTA	12.4	14.1	14	14	23	27	10.0
OH	Cleveland-RTA	26.7	28.9	29	0	26	49	13.0
OR	Portland-Tri-Met	30.2	29.1	27	2	23	26	9.1
PA	Philadelphie-SEPTA	69.3	171.0	64	0	100	147	14.9
PA	Pittsburgh-PAT	38.1	46.5	13	0	44	71	17.3
TN	Memphis-MATA	4.3	4.0	20	20	5	7	1.6
TX	Galveston-Island Transit	4.7	4.7	3	1	4	4	6.0
WA	Seattle-Metro	4.2	2.1	14	0	3	5	66.2
	Total	561.9	694.8	475	164	769	1,031	
	Weighted Average							14.3

Demand Response Agencies

The 15 demand response agencies listed in **Exhibits 26**, **27**, and **28** are those reporting the most vehicles operating in maximum service. As **Exhibit 26** demonstrates, these agencies reported over 36 percent of the total demand response service operated in the United States in terms of vehicle revenue miles. These agencies carried over 30 percent of the nation's demand response riders and realized over 33 percent of the demand response passenger miles. This is the only mode in the NTD in which the participation of the private sector is higher than that of the public sector. Private providers generated over 93 percent of the vehicle revenue miles, 95 percent of the vehicle revenue hours, and 95.6 percent of the unlinked passenger trips in 1994.

Performance measure indicators for demand response are displayed in **Exhibit 27**. The exhibit demonstrates that 8 of these 15 demand response agencies operated more efficiently than the national average in terms of service supplied based on cost per vehicle revenue mile. In terms of cost effectiveness of the service consumed, a majority of these agencies were not as effective as the national average based on cost per unlinked passenger trip and per passenger mile. As for the service effectiveness of these agencies, only four are better than the national average, as measured by unlinked passenger trips per vehicle revenue miles. This low service effectiveness is not surprising, given the fact that demand response service becomes less effective as the demand for this mode increases. This is due to the low capacity nature of demand response combined with its operational characteristics.

Key Demand Response Operating Characteristics of Transit Agencies 1994

Exhibit 26

ST	Agency Name	Type of Service	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-OCTA	PT	4,754.2	368.7	1,581.9	5.8	8,722.4
CA	LA-LACMTA	PT	3,469.5	257.2	1,137.2	3.9	4,827.8
FL	Ft. Lauderdale-Bct	PT	4,452.5	366.3	701.5	2.4	5,793.4
FL	Miami-MDTA/Comprehensive	DO	415.1	23.7	20.8	0.1	212.4
		PT	10,826.0	808.3	1,700.5	7.1	14,128.9
	Total		11,241.1	832.0	1,721.3	7.2	14,341.3
HI	Honolulu-HDOT-Mayflower	PT	3,964.6	281.3	706.1	2.5	9,468.9
IL	Chicago-RTA-CTA	PT	6,719.7	712.4	1,209.9	3.9	9,723.1
IL	Chicago-RTA-Pace	DO	97.1	6.5	26.0	0.1	154.1
		PT	6,832.0	421.2	1,490.2	5.8	8,821.9
	Total		6,929.0	427.7	1,516.2	5.9	8,976.0
MA	Fitchburg-MART	PT	3,975.4	336.5	606.1	2.1	3,975.4
PA	Philadelphia-SEPTA	PT	7,776.8	677.1	1,279.2	4.7	8,007.9
PA	Pittsburgh-PAT/ACCESS	PT	12,228.3	835.1	1,904.6	6.6	11,692.2
TX	Dallas-DART	PT	8,695.4	540.4	903.3	3.0	10,518.6
TX	Houston-Metro	PT	7,280.2	420.2	868.8	2.9	8,703.5
TX	San Antonio-VIA	DO	5,481.2	326.9	693.0	2.4	7,196.6
		PT	2,891.2	138.7	279.8	1.0	3,877.7
	Total		8,372.3	465.5	972.8	3.3	11,074.2
WA	Seattle-Metro	PT	2,602.5	195.6	608.8	2.2	4,655.0
WI	Milwaukee-Paratransit	PT	4,961.5	422.5	807.5	2.7	4,193.0
		DO Total	5,993.3	357.0	739.8	2.6	7,563.0
		PT Total	91,429.7	6,781.5	15,785.5	56.5	117,109.6
		Total	97,423.0	7,138.6	16,525.3	59.1	124,672.6
		Percentage of DO	8.85	7.25	5.22	4.87	6.98
		Percentage of PT	44.58	46.09	39.58	39.70	43.65
		Percentage of Total	35.71	36.36	30.57	30.20	33.10

Key Demand Response Performance Indicators of Transit Agencies 1994

Exhibit 27

ST	Agency Neme	Opereting Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-OCTA	$2.81	$36.27	$8.45	$1.53	0.33	4.29	23.66	12.89
CA	LA-LACMTA	2.87	38.70	8.75	2.06	0.33	4.42	18.77	13.49
FL	Ft. Leuderdele-Bct	1.83	22.26	11.62	1.41	0.16	1.92	15.82	12.15
FL	Miemi-MDTA/Comprehensive	2.26	30.52	14.75	1.77	0.15	2.07	17.24	13.51
HI	Honolulu-HDOT-Meyflower	2.36	33.29	13.26	0.99	0.18	2.51	33.66	14.09
IL	Chicago-RTA-CTA	3.43	32.39	19.07	2.37	0.18	1.70	13.65	9.43
IL	Chicago-RTA-Pace	1.97	31.94	9.01	1.52	0.22	3.55	20.99	16.20
MA	Fitchburg-MART	6.42	75.86	42.11	6.42	0.16	1.80	11.81	11.81
PA	Philadelphia-SEPTA	3.00	34.43	18.22	2.91	0.16	1.89	11.83	11.49
PA	Pittsburgh-PAT/ACCESS	1.70	24.92	10.92	1.78	0.16	2.28	14.00	14.64
TX	Delles-DART	1.71	27.58	16.50	1.42	0.10	1.67	19.46	16.09
TX	Houston-Metro	1.25	21.74	10.51	1.05	0.12	2.07	20.72	17.33
TX	San Antonio-VIA	1.67	30.07	14.39	1.26	0.12	2.09	23.79	17.98
WA	Seattle-Metro	4.56	60.60	19.47	2.55	0.23	3.11	23.79	13.30
WI	Milwaukee-Paretrensit	1.60	18.75	9.81	1.89	0.16	1.91	9.92	11.74
	Average of Agencies	$2.37	$32.28	$13.94	$1.85	0.17	2.31	17.46	13.65
	National Average for Demand Response	$2.32	$32.29	$11.73	$1.68	0.20	2.75	19.21	13.92

Data about infrastructure for demand response are displayed in **Exhibit 28**. It shows that 4,933 demand response vehicles are operated in maximum service by the 15 agencies presented. This represents 38.4 percent of all demand response vehicles operated nationally in maximum service.

Exhibit 28

Key Demand Response Infrastructure Characteristics of Transit Agencies 1994

ST	Agency Name	Operating Expense (000s)	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-OCTA	$13,371.9	219	260	4.0
CA	LA-LACMTA	9,955.0	199	199	4.9
FL	Ft. Lauderdale-Bct	8,149.2	427	448	2.4
FL	Miami-MDTA/Comprehensive	25,393.0	423	437	1.7
HI	Honolulu-HDOT-Mayflower	9,364.7	184	239	2.4
IL	Chicago-RTA-CTA	23,070.1	1,034	1,054	2.1
IL	Chicago-RTA-Pace	13,660.7	330	352	3.3
MA	Fitchburg-MART	25,526.8	230	258	3.2
PA	Philadelphia-SEPTA	23,309.8	265	296	1.7
PA	Pittsburgh-PAT/ACCESS	20,806.1	413	468	4.2
TX	Dallas-DART	14,903.0	319	369	2.3
TX	Houston-Metro	9,134.3	211	1,926	2.2
TX	San Antonio-VIA	14,001.1	200	212	4.4
WA	Seattle-Metro	11,854.7	205	421	2.1
WI	Milwaukee-Paratransit	7,924.5	274	391	4.6
	Agencies Total	$230,424.8	4,933	7,330	
	Weighted Average				3.3
	Total Demand Response Mode	$633,896.3	12,828	17,447	
	Weighted Average				3.7

Trolleybus Agencies

Exhibits 29, 30, and **31** provide data regarding the five trolleybus agencies included in the NTD. This mode consists of rubber-tired vehicles supplied with electric power from overhead lines. The mode has remained relatively stable since 1990 in both service supplied and consumed. As seen in **Exhibit 29**, the San Francisco-Muni transit agency accounted for over 54 percent of the vehicle revenue miles operated, over 61 percent of the vehicle revenue hours, 67 percent of the trolleybus riders carried, and 61 percent of the passenger miles realized.

Exhibit 29

Key Trolleybus Operating Characteristics of Transit Agencies 1994

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	San Francisco-Muni	DO	$73,322.2	7,144.9	993.0	78,752.1	243.8	113,224.1
MA	Boston-MBTA	DO	822.5	743.5	57.2	3,274.8	11.2	7,794.9
OH	Deyton-RTA	DO	8,171.6	1,176.1	111.4	2,708.5	9.0	6,899.4
PA	Philedelphie-SEPTA	DO	9,265.1	832.3	100.5	10,155.0	34.1	17,361.4
WA	Seattle-Metro	DO	33,952.0	3,256.0	351.4	22,610.2	72.2	41,644.8
		Total	$125,533.4	13,152.8	1,613.5	117,500.5	370.3	186,924.5

As demonstrated in **Exhibit 30**, San Francisco-Muni is generally the most efficient and cost effective of the trolleybus systems. Dayton also demonstrates a high level of efficiency. Philadelphia attained the highest level of service effectiveness.

Key Trolleybus Performance Indicators of Transit Agencies 1994 **Exhibit 30**

ST	Agency Name	Opereting Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	San Francisco-Muni	$10.26	$73.64	$0.93	$0.65	11.02	79.31	114.02	7.20
MA	Boston-MBTA	11.07	143.67	2.51	1.06	4.40	57.26	136.30	13.00
OH	Dayton-RTA	6.95	73.37	3.02	1.16	2.30	24.32	61.95	10.56
PA	Philadelphia-SEPTA	11.13	92.22	0.91	0.53	12.20	101.08	172.82	6.26
WA	Seattle-Metro	10.43	96.61	1.50	0.82	6.94	64.34	118.50	9.26
	Average	$10.11	$82.39	$1.13	$0.71	8.93	72.82	115.85	8.15

As shown in **Exhibit 31**, the San Francisco-Muni transit agency operates 57 percent of the trolleybus vehicles operated in maximum service. Seattle-Metro, however, provides 25 percent of the trolleybus vehicles operating in maximum service and accounts for 27 percent of the trolleybus directional route miles, compared with 31.5 percent for San Francisco-Muni and 26 percent for Dayton.

Key Trolleybus Infrastructure Characteristics of Transit Agencies 1994 **Exhibit 31**

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available in Maximum Service	Average Fleet Age
CA	San Francisco-Muni	131.5	270	344	15.7
MA	Boston-MBTA	21.6	23	43	19.0
OH	Dayton-RTA	108.7	26	39	17.0
PA	Philadelphia-SEPTA	42.5	35	52	15.0
WA	Seattle-Metro	112.6	118	165	12.1
	Total	416.9	472	643	
	Weighted Average				15.1

Ferryboat Agencies

Exhibits 32, 33, and **34** offer information on the nation's 14 ferryboat agencies included in the NTD. **Exhibit 32** shows that the Washington State Department of Transportation operating in Seattle reports over 46 percent of the vehicle revenue miles operated, nearly 42 percent of the vehicle revenue hours operated, 30.2 percent of the unlinked passenger trips, and 44.5 percent of the passenger miles.

Purchased transportation consumes 8.43 percent of the total operating expenses for ferryboat and generates 21.2 percent of the total vehicle revenue miles.

Exhibit 32

Key Ferryboat Operating Characteristics of Transit Agencies
1994

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	Oakland-AOFS	PT	$1,838.2	106.5	8.2	371.7	1.1	2,490.8
CA	Oakland-Vallejo Transit	PT	2,008.7	71.8	3.4	193.7	0.5	6,004.5
CA	SF-Golden Gate	DO	10,096.9	138.7	11.0	1,403.8	4.5	15,162.0
CT	Hartford-Conn DOT	DO	530.5	8.1	4.7	172.2	0.6	38.1
LA	New Orleens-Cresent City	DO	4,166.5	46.1	23.1	4,005.6	11.4	2,002.8
MA	Boston-MBTA	PT	3,675.2	100.0	7.1	811.8	3.0	6,025.9
ME	Portlend-C8L	DO	1,579.9	62.2	13.7	668.8	2.1	2,274.1
NY	New York City DOT	DO	31,606.2	169.3	16.3	17,523.3	59.4	91,121.0
NY	Port Authority-PATH	PT	4,694.0	86.7	10.0	2,355.0	8.8	4,003.0
PR	Sen Juen-Port Authority	DO	8,129.3	259.0	47.0	1,689.4	4.4	4,039.3
VA	Norfolk-TRT	PT	523.1	12.2	6.1	485.4	1.3	242.7
WA	Bremerton-Kitsap Transit	PT	643.2	42.8	10.7	403.0	1.5	377.6
WA	Seattle-Weshington DOT	DO	113,521.3	993.0	119.6	13,099.6	35.3	108,201.3
WA	Tacome-Pierce Ferry	PT	920.3	31.0	4.9	140.8	0.4	1,029.5
		DO Total	$169,630.5	1,676.5	235.3	38,562.7	117.8	222,838.4
		PT Total	$14,302.7	451.0	50.4	4,761.4	16.6	20,173.9
		Total	$183,933.2	2,127.4	285.6	43,324.1	134.3	243,012.4

Exhibit 33 reflects the high cost of ferryboat service and also shows its high service effectiveness. The Staten Island Ferry operated by the New York City Department of Transportation realized over 103 unlinked passenger trips per mile and over 1,070 unlinked passenger trips per hour.

Exhibit 33

Key Ferryboat Performance Indicators of Transit Agencies
1994

ST	Agency Name	Operating Expense				Pessenger Trips		Pessenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	Oakland-AOFS	$17.26	$224.94	$4.95	$0.74	3.49	45.48	304.80	13.03
CA	Oakland-Vallejo Transit	27.98	595.16	10.37	0.33	2.70	57.39	1,779.10	21.27
CA	SF-Golden Gate	72.82	920.07	7.19	0.67	10.12	127.92	1,381.63	12.63
CT	Hartford-Conn DOT	65.13	112.58	3.08	13.94	21.15	36.55	8.08	1.73
LA	New Orleans-Cresent City	90.36	180.68	1.04	2.08	86.87	173.70	86.85	2.00
MA	Boston-MBTA	36.76	514.52	4.53	0.61	8.12	113.65	843.61	14.00
ME	Portland-CBL	25.39	115.31	2.36	0.69	10.75	48.82	165.98	4.54
NY	New York City DOT	186.72	1,941.89	1.80	0.35	103.52	1,076.63	5,598.49	10.40
NY	Port Authority-PATH	54.14	471.76	1.99	1.17	27.16	236.68	402.31	8.71
PR	Sen Juan-Port Authority	31.39	172.96	4.81	2.01	6.52	35.94	85.94	5.51
VA	Norfolk-TRT	42.94	86.22	1.08	2.16	39.84	80.01	40.01	2.01
WA	Bremerton-Kitsep Trensit	15.02	59.90	1.60	1.70	9.41	37.53	35.17	3.99
WA	Seattle-Weshington DOT	114.32	949.59	8.67	1.05	13.19	109.58	905.09	8.31
WA	Tacoma-Pierce Ferry	29.70	187.69	6.53	0.89	4.54	28.72	209.96	6.32
	Average	$86.45	$644.02	$4.24	$0.76	20.36	151.70	850.88	7.45

Exhibit 34 again demonstrates the significance of the Washington State Department of Transportation's ferryboat service in terms of infrastructure. Over 35 percent of the vehicles operated in maximum service are reported by this agency.

Key Ferryboat Infrastructure Characteristics of Transit Agencies 1994 **Exhibit 34**

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	Oakland-AOFS	30.5	3	4	10.2
CA	Oakland-Vallejo Transit	79.6	1	1	9.0
CA	SF-Golden Gate	38.7	4	4	20.8
CT	Hartford-Conn DOT	0.9	2	2	42.0
LA	New Orleans-Cresent City	3.0	5	6	23.6
MA	Boston-MBTA	10.6	7	9	17.6
ME	Portland-CBL	20.0	3	4	21.3
NY	New York City DOT	10.4	4	7	18.4
NY	Port Authority-PATH	3.4	4	5	4.4
PR	San Juan-Port Authority	0.0	6	8	8.0
VA	Norfolk-TRT	1.0	2	3	8.0
WA	Bremerton-Kitsap Transit	31.5	5	6	32.8
WA	Seattle-Washington DOT	245.8	25	25	30.6
WA	Tacoma-Pierce Ferry	11.1	1	2	43.0
	Total	486.5	72	86	
	Weighted Average				22.0

Automated Guideway Agencies

Information concerning the four automated guideway agencies is given in **Exhibit 35.** One new operator of this mode was added in 1994: Tampa-Hartline in Florida. The first automated guideway system implemented in the United States in Morgantown, West Virginia, is not included as it does not serve an urbanized area of more than 50,000 population. Miami is the agency with the highest share of operating expenses, and service supplied and consumed, followed by Detroit.

Key Automated Guideway Operating Characteristics of Transit Agencies 1994 **Exhibit 35**

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
FL	Jacksonville-JTA	DO	$719.8	72.3	5.2	269.4	1.0	156.6
FL	Miami-MDTA	DO	10,705.7	530.8	48.7	3,587.6	11.4	3,623.1
FL	Tampa-Hartline	PT	106.9	36.3	9.2	386.2	1.3	166.0
MI	Detroit-DTC	DO	7,671.9	494.1	42.6	2,393.8	6.5	3,401.7
		DO Total	$19,097.5	1,097.2	96.5	6,250.9	18.8	7,181.4
		PT Total	$106.9	36.3	9.2	386.2	1.3	166.0
		Total	$19,204.4	1,133.5	105.7	6,637.0	20.1	7,347.4

Performance measures for automated guideway systems are displayed in **Exhibit 36.** The efficiency (cost per revenue mile) of these systems correlates to the amount of service supplied. The agencies with the poorest efficiency are Miami and Detroit, and they are the greatest providers of automated guideway service. The new system in Tampa displays the best service effectiveness among automated guideway agencies.

Exhibit 36

Key Automated Guideway Performance Indicators of Transit Agencies 1994

ST	Agency Name	Opereting Expense				Pessenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Pessenger Trip (UPT)	Per Pessenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
FL	Jacksonville-JTA	$9.95	$137.92	$2.67	$4.60	3.72	51.62	30.01	13.86
FL	Miami-MDTA	20.17	219.81	2.98	2.95	6.76	73.66	74.39	10.90
FL	Tempe-Hertline	2.94	11.65	0.28	0.64	10.63	42.10	18.10	3.96
MI	Detroit-DTC	15.53	180.13	3.20	2.28	4.84	56.20	79.87	11.60
	Average	$16.94	$181.70	$2.89	$2.61	5.85	82.79	69.51	10.72

Infrastructure data for automated guideway agencies are shown in **Exhibit 37**. It shows that automated guideway systems have limited infrastructure and serve small portions of the metropolitan areas where they are located. Miami is the system with the highest amount of fixed guideway directional route miles as well as vehicles operated in maximum service.

Exhibit 37

Key Automated Guideway Infrastructure Characteristics of Transit Agencies 1994

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
FL	Jacksonville-JTA	1.2	2	2	5.0
FL	Miami-MDTA	8.5	19	29	3.9
FL	Tampa-Hartline	0.9	2	2	9.0
MI	Detroit-DTC	2.9	8	8	8.0
	Total	13.5	31	41	
	Weighted Average				5.3

Chapter 3
Key Characteristics by Urbanized Areas

Introduction

The previous chapter presented key characteristics of several transit modes as shown by the largest transit agencies and private providers. Another way of examining the National Transit Database is to consider urbanized areas (UZAs). The Federal Transit Administration (FTA) apportions transit operating assistance to eligible UZAs based on an annual legislative apportionment process. This chapter presents data on key characteristics of UZAs. This information is helpful in understanding the data presented in subsequent chapters which also present data based on UZA size.

Chapter Organization

This chapter provides information about the relationships among the amount of transit service and the number of UZAs, the size of UZAs, and the number of transit agencies that provide transit service. The key characteristics of the various sizes of UZAs, the types and the number of modes operated, and the number of transit agencies reporting transit services are also discussed.

Urbanized Area

A UZA is a unique geographical area with a population of 50,000 or more, as designated by the U.S. Department of Commerce's Bureau of the Census. Boundaries are fixed by the Bureau of the Census. UZAs are determined every 10 years with each national census. A UZA generally consists of one or more cities and surrounding population areas and may include areas in more than one State.

For purposes of the *National Transit Summaries and Trends*, UZAs are classified by three groups: small UZAs with 50,000 to 199,999 population; mid-size UZAs with 200,000 to 1 million population; and large UZAs with over 1 million population.

The profiles by UZA size, found in **Exhibits 38, 39,** and **40,** depict the U.S. transit industry aggregated from the perspective of small, medium, and large UZAs. The information presented shows the different characteristics of transit agencies grouped by UZA size.

From the information presented, it is clear that large UZAs (those with over 1 million population) dominate the transit industry in service supplied and consumed as well as in capital investment and operating expenses. This dominance is not surprising given that the

Exhibit 38
National Transit Profile
for Urbanized Areas With Less Than 200,000 Population
1994

General Information (System Wide)

Service Consumption (millions)	
Annual Passenger Miles	952.8
Annual Unlinked Trips	237.2
Average Weekday Unlinked Trips	0.8
Average Saturday Unlinked Trips	0.4
Average Sunday Unlinked Trips	0.1
Service Supplied	
Annual Vehicle Revenue Miles (millions)	179.7
Annual Vehicle Revenue Hours (millions)	13.0
Total Fleet	7,837
Vehicles Operated in Maximum Service	6,308
Base Period Requirement	2,102

Vehicles Operated in Maximum Service

Directly Operated	**Vehicles**	**Agencies ***
Bus	3,006	154
Light Rail	4	1
Demand Response	1,017	93
Other	220	8
Total	**4,247**	**256**

Purchased Transportation	**Vehicles**	**Agencies ***
Bus	532	40
Light Rail	0	0
Demand Response	1,517	109
Other	12	2
Total	**2,061**	**151**

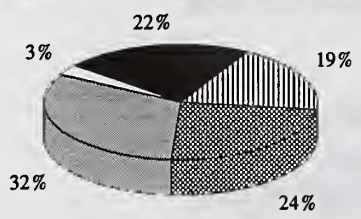
Financial Information (System Wide)

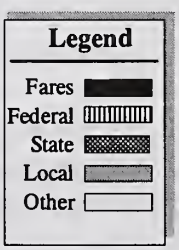
Sources of Operating Funds Expended (millions)	
Passenger Fares	$120.5
Local Funds	176.0
State Funds	131.9
Federal Assistance	105.1
Other Funds	17.7
Total Operating Funds Expended	**$551.2**
Summary of Operating Expenses (millions)	
Salaries/Wages/Benefits	$311.8
Materials & Supplies	57.6
Purchased Transportation	103.6
Other Expenses	67.2
Total Operating Expenses	**$540.1**
Reconciling Cash Expenditures (millions)	$10.1
Sources of Capital Funds Expended (millions)	
Local Funds	$29.2
State Funds	22.9
Federal Assistance	62.2
Total Capital Funds Expended	**$114.3**

Uses of Capital Funds (millions)

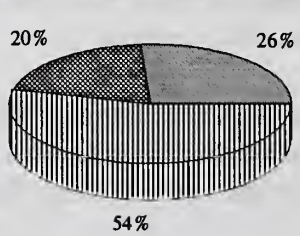
	Rolling Stock	**Facilities and Other**	**Total**
Bus	$62.3	$40.2	$102.5
Light Rail	0.0	0.0	0.0
Demand Response	8.0	2.1	10.2
Other	0.8	0.6	1.4
Total	**$71.2**	**$42.9**	**$114.1**

Sources of Operating Funds Expended





Sources of Capital Funds Expended



* Number of Agencies by Mode

Exhibit 39
National Transit Profile for Urbanized Areas from 200,000 to 1 Million Population 1994

General Information (System Wide)

Service Consumption (millions)	
Annual Passenger Miles	2,779.0
Annual Unlinked Trips	685.7
Average Weekday Unlinked Trips	2.3
Average Saturday Unlinked Trips	1.2
Average Sunday Unlinked Trips	0.5

Service Supplied	
Annual Vehicle Revenue Miles (millions)	375.5
Annual Vehicle Revenue Hours (millions)	26.6
Total Fleet	14,640
Vehicles Operated in Maximum Service	11,370
Base Period Requirement	4,731

Vehicles Operated in Maximum Service Directly Operated	Vehicles	Agencies *
Bus	7,588	95
Heavy Rail	0	0
Commuter Rail	0	0
Light Rail	28	2
Demand Response	817	45
Other	197	10
Total	**8,630**	**152**

Purchased Transportation	Vehicles	Agencies *
Bus	472	29
Heavy Rail	0	0
Commuter Rail	13	1
Light Rail	0	0
Demand Response	2,023	73
Other	232	5
Total	**2,740**	**108**

Financial Information (System Wide)

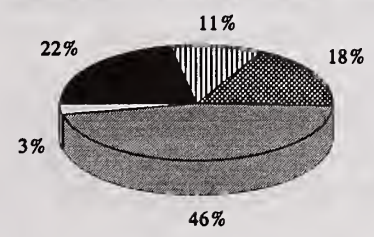
Sources of Operating Funds Expended (millions)	
Passenger Fares	$328.3
Local Funds	694.3
State Funds	276.5
Federal Assistance	164.5
Other Funds	40.0
Total Operating Funds Expended	**$1,503.5**

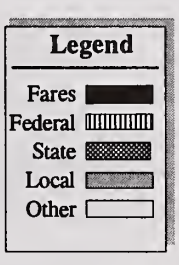
Summary of Operating Expenses (millions)	
Salaries/Wages/Benefits	$933.1
Materials & Supplies	156.3
Purchased Transportation	123.8
Other Expenses	180.7
Total Operating Expenses	**$1,393.9**
Reconciling Cash Expenditures (millions)	$28.6

Sources of Capital Funds Expended (millions)	
Local Funds	$49.5
State Funds	50.2
Federal Assistance	202.8
Total Capital Funds Expended	**$302.6**

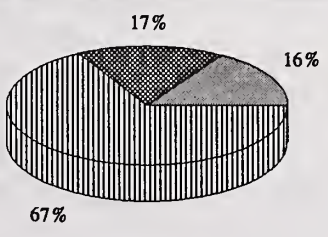
Uses of Capital Funds (millions)	Rolling Stock	Facilities and Other	Total
Bus	$105.9	$86.1	$192.0
Heavy Rail	0.0	4.5	4.5
Commuter Rail	1.5	60.0	61.5
Light Rail	0.3	1.8	2.2
Demand Response	15.4	9.8	25.1
Other	4.0	13.2	17.2
Total	**$127.2**	**$175.4**	**$302.6**

Sources of Operating Funds Expended





Sources of Capital Funds Expended



* Number of Agencies by Mode

Exhibit 40
National Transit Profile
for Urbanized Areas With Over 1 Million Population
1994

General Information (System Wide)

Service Consumption (millions)	
Annual Passenger Miles	34,149.8
Annual Unlinked Trips	6,778.7
Average Weekday Unlinked Trips	22.4
Average Saturday Unlinked Trips	11.8
Average Sunday Unlinked Trips	7.9
Service Supplied	
Annual Vehicle Revenue Miles (millions)	2,124.3
Annual Vehicle Revenue Hours (millions)	140.7
Total Fleet	69,959
Vehicles Operated in Maximum Service	55,970
Base Period Requirement	25,446

Vehicles Operated in Maximum Service **Directly Operated**	**Vehicles**	**Agencies ***
Bus	29,949	90
Heavy Rail	8,277	14
Commuter Rail	3,828	9
Light Rail	737	16
Demand Response	1,142	47
Other	1,325	21
Total	**45,258**	**197**

Purchased Transportation	**Vehicles**	**Agencies ***
Bus	2,176	53
Heavy Rail	0	0
Commuter Rail	508	9
Light Rail	0	0
Demand Response	6,312	75
Other	1,716	13
Total	**10,712**	**150**

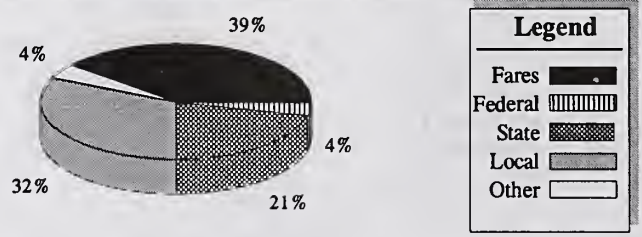
Financial Information (System Wide)

Sources of Operating Funds Expended (millions)	
Passenger Fares	$6,017.6
Local Funds	4,945.1
State Funds	3,218.3
Federal Assistance	591.9
Other Funds	516.9
Total Operating Funds Expended	**$15,290.0**
Summary of Operating Expenses (millions)	
Salaries/Wages/Benefits	$10,971.5
Materials & Supplies	1,298.3
Purchased Transportation	761.0
Other Expenses	1,355.0
Total Operating Expenses	**$14,385.9**
Reconciling Cash Expenditures (millions)	$922.7
Sources of Capital Funds Expended (millions)	
Local Funds	$1,996.1
State Funds	932.4
Federal Assistance	2,253.0
Total Capital Funds Expended	**$5,181.5**

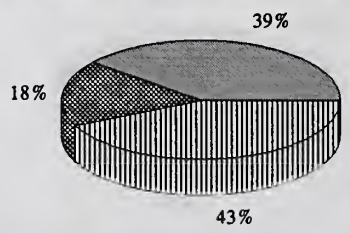
Uses of Capital Funds (millions)

	Rolling Stock	**Facilities and Other**	**Total**
Bus	$443.7	$609.8	$1,053.5
Heavy Rail	212.6	1,852.9	2,065.5
Commuter Rail	225.1	1,099.8	1,324.9
Light Rail	56.1	464.0	520.1
Demand Response	19.9	6.7	26.6
Other	95.6	95.3	190.9
Total	**$1,053.0**	**$4,128.6**	**$5,181.5**

Sources of Operating Funds Expended



Sources of Capital Funds Expended



* Number of Agencies by Mode

nature of transit service in these UZAs is to transport a large number of people. Nationally, agencies in large UZAs provide 80 percent of vehicle revenue miles of service operated, 88 percent of all unlinked passenger trips made, and 90.1 percent of all passenger miles accumulated. They receive 84.2 percent of all Federal financial assistance made available to transit for operating expenses and capital investment and account for over one-third of the agencies reporting. What is apparent in these exhibits is the shift away from capital investment in bus expenditures (as a percentage of capital funding) to greater investments in fixed guideway (mostly rail systems) by agencies in large UZAs. Again, this is not surprising, because the greater population densities found in large UZAs justify the substantial capital expenditures made to build and maintain fixed guideway systems.

The Bureau of the Census has designated 405 UZAs within the United States, the District of Columbia, and Puerto Rico, as reflected in **Exhibit 41**. Of these, 345, or 85.2 percent, have reported some form of transit service being provided. Depending on the size of the UZA, the percentage of UZAs reporting declines as the UZA becomes smaller. The largest UZAs all have transit service provided. This is also the case for mid-size UZAs. The smallest UZAs have 221, or 79 percent, out of a possible 280 UZAs reporting. In addition, the number of transit providers in a UZA is greater for large UZAs and less numerous for the smaller UZAs. The majority of UZAs are reported by only one transit agency.

Number of Urbanized Areas Reporting Per Urbanized Area Size 1994 **Exhibit 41**

Urbanized Area Size	Number of UZAs per 1990 Census	Number of UZAs Reporting	Number of Modes Reporting Transit Service
Under 200,000 Population	280	221	407
200,000 to 1 Million Population	91	90	260
Over 1 Million Population	34	34	347
Total	405	345	1,014
50 States and District of Columbia	396	344	1,009
Puerto Rico	9	1	5

The geographic boundaries of UZAs may extend beyond one State. Some of the largest UZAs cover multistate jurisdictions, such as Northeastern New Jersey and New York for the metropolitan New York City area. Similarly, Chicago's UZA extends into Indiana, while Philadelphia's extends into New Jersey and Delaware. As displayed in **Exhibit 42**, a summary of the three classifications of UZAs by the number of States that they comprise is provided. The exhibit indicates that 86.9 percent of UZAs do not extend beyond a State line. The Wilmington, Delaware UZA is unique in that it extends to three other States beyond Delaware, to include Maryland, New Jersey, and Pennsylvania.

Exhibit 42

Multiple State Urbanized Areas
1994

Urbanized Areas	UZAs	50,000 to 199,999	200,000 to 1 Million	Over 1 Million
Within One State	352	252	74	26
Within Two States	46	24	15	7
Within Three States	6	4	1	1
Within Four States	1	-	1	-
Total	405	280	91	34

The number of UZAs reporting by mode and type of service is displayed in **Exhibit 43**. Almost all transit agencies with the largest infrastructures intended primarily to support rail systems are located in the largest UZAs. This is because of several factors, not the least of which is a large population base that can support rail system modes. The largest UZAs have a high density development and well defined transportation corridors, all of which make rail modes extremely attractive. Of the three rail modes identified in **Exhibit 43**, only four transit agencies provide some form of rail service that operates in UZAs of less than 1 million population. Most UZAs are served by a combination of bus and demand response transit agencies, because these modes are less capital intensive and more flexible in serving areas with a low population density.

Exhibit 43

Number of Urbanized Areas Reporting by Mode and Type of Service
1994

UZA Size		Mode					
		MB	HR	CR	LR	DR	Other
Under 200,000 Population	DO	165	0	0	1	103	8
	PT	42	0	0	0	116	2
Total		207	0	0	1	219	10
200,000 to 1 Million Population	DO	45	0	0	2	45	10
	PT	29	0	1	0	72	5
Total		74	0	1	2	117	15
Over 1 Million Population	DO	94	14	9	16	50	21
	PT	53	0	9	0	23	9
Total		147	14	18	16	73	30
Directly Operated	DO	354	14	9	19	198	39
Purchased Transportation	PT	124	0	10	0	261	16
Total		478	14	19	19	459	55

The number of UZAs reporting continued to increase during the 1990-1994 timeframe. The increase in the number of UZAs reporting was 10.6 percent between 1990 and 1994. This increase is documented in **Exhibit 44**.

Number of Urbanized Areas Reporting
1990-1994

Exhibit 44

UZA Size	1990	1991	1992	1993	1994
Under 200,000 Population	188	210	204	211	221
200,000 to 1 Million Population	90	90	90	90	90
Over 1 Million Population	34	34	34	34	34
UZAs Reporting	312	334	328	335	345
UZAs Not Reporting	93	71	77	70	60
Total UZAs	405	405	405	405	405

Exhibits 45 through 47 indicate the modes of services provided by transit agencies since 1990 for each of the three UZA size classifications. The growth in the number of modes of service in each category of UZA size reflects, in part, the continuation of the FTA's capital participation and the number of new starts that have occurred.

Number of Urbanized Areas Reporting by Mode
(Less Than 200,000 Population)
1990-1994

Exhibit 45

Mode	1990	1991	1992	1993	1994
Bus	172	174	180	187	196
Heavy Rail	0	0	0	0	0
Commuter Rail	4	4	4	4	5
Light Rail	1	1	1	1	3
Demand Response	149	157	166	183	199

Number of Urbanized Areas Reporting by Mode
(200,000 to 1 Million Population)
1990-1994

Exhibit 46

Mode	1990	1991	1992	1993	1994
Bus	89	89	89	89	90
Heavy Rail	0	0	0	0	2
Commuter Rail	7	7	7	8	8
Light Rail	1	1	1	2	6
Demand Response	82	83	85	85	88

Number of Urbanized Areas Reporting by Mode
(Over 1 Million Population)
1990-1994

Exhibit 47

Mode	1990	1991	1992	1993	1994
Bus	34	34	34	34	34
Heavy Rail	10	10	11	11	11
Commuter Rail	12	11	12	12	13
Light Rail	12	14	15	15	17
Demand Response	30	30	32	33	33

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Chapter 4
Capital Funding

Introduction

Capital investment in transit declined in 1994, reversing a trend of increase that has been observed during the last 5 years. Total dollars invested in the transit industry in 1994 dropped by over 2.3 percent in relation to 1993.

Chapter Organization

This chapter begins with a review of the sources of capital funding. It then discusses the uses of capital funds by mode and by category of use. Finally, information on uses of capital funds for individual systems is presented for each mode.

Sources of Capital Funds

Federal capital assistance continues to be the single largest source of funds for capital investment in transit infrastructure. Of the over $5.5 billion used in 1994 for capital investment in transit infrastructure expansion and rehabilitation, Federal assistance accounted for nearly 45 percent. Local funds represented 37 percent and State funding contributed 18 percent of the capital assistance provided. The sources and amounts of capital funding for the 1990-1994 timeframe are given in **Exhibit 48.** The reduction in capital funding observed in 1994 correlates to the sharp decline in State capital dollars, which suffered a reduction of 23.6 percent from 1993 to 1994. It should be noted, however, that in 1993 the contribution of State funds increased by 69 percent in relation to 1992, representing 23 percent of total capital investment in 1993. Previously, between 1990 and 1993, the share of State assistance displayed a stable behavior, ranging between 12 and 15 percent of the total capital investment. The share of State funds in 1994 accounted for 18 percent of the capital invested and is therefore higher than the average share for the years preceding 1993. This is an indication that despite the fact that Federal assistance increased and State assistance dropped sharply in 1994, the share of Federal dollars in the transit industry is declining while the share of local and State dollars is increasing. Federal assistance increased by 5.6 percent in 1994, while local assistance remained stable, with a slight increase of 2 percent.

Distribution of Capital Funds by UZA Size and Source

Urbanized areas (UZAs) with a population of more than 1 million inhabitants account for nearly $5.2 billion, or over 92 percent, of the capital investment made in the transit infrastructure in 1994. This is due to the substantial fixed guideway systems in place or being developed in the nation's large metropolitan areas. These systems also require large fleets of vehicles to accommodate the needs of passengers, to maintain significant capital assets, as well as to provide sophisticated signaling and control systems and maintenance facilities.

Exhibit 48

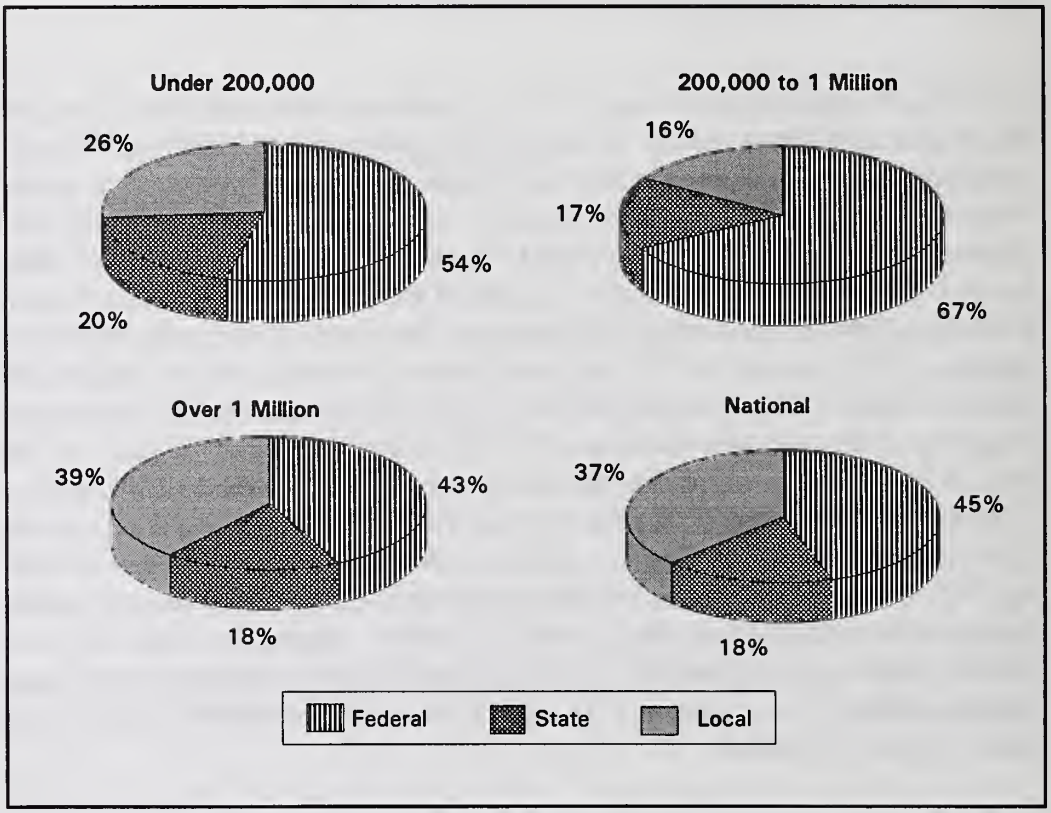
Sources of Capital Funds
(Millions)
1990-1994

	1990	1991	1992	1993	1994
Federal	$2,636.3	$2,545.0	$2,598.7	$2,383.5	$2,518.1
State	644.6	638.1	777.7	1,316.7	1,005.5
Local	1,254.6	1,914.2	1,906.2	2,033.4	2,074.8
Total	$4,535.5	$5,097.3	$5,282.6	$5,733.6	$5,598.4

As presented in **Exhibit 49**, large UZAs rely more heavily than mid-size and small UZAs on local funding sources to meet capital needs. Because of the substantial investment needed to maintain their transit infrastructures, large UZAs must commit more capital funds from local resources than mid-size and small UZAs, which have far less transit infrastructure.

Exhibit 49

Uses of Capital Funds by UZA Size and Source
1994



Uses of Capital Funds

Uses of capital funds are identified by mode and category of use in **Exhibit 50**. The categories of use are rolling stock, facilities and other capital expenditures. The remaining categories, facilities and other capital, are everything not related to rolling stock.

Exhibit 50

Uses of Capital Funds by Mode
(Millions)
1994

	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	Total
Rolling Stock	$611.9	$212.6	$226.6	$56.4	$43.3	$100.5	$1,251.3
Facilities	524.6	1,078.8	914.8	440.4	10.1	71.5	$3,040.2
Other Capital	211.5	778.6	245.0	25.5	8.5	37.5	$1,306.6
Total	$1,348.0	$2,070.0	$1,386.4	$522.3	$61.9	$209.5	$5,598.1

Rolling stock includes revenue vehicles used in providing transit service for passengers. Rolling stock expenditures include the acquisition of new vehicles, replacement revenue vehicles, and major components and parts necessary for returning a revenue vehicle to an operable condition. This category also includes expenditures for rehabilitation, overhaul, or remanufacture of revenue vehicles.

Facilities and other capital expenditures include everything not related to rolling stock. This category includes items such as construction and rehabilitation of maintenance facilities; crime prevention and security equipment; track; line equipment and structures; signals and communications; power equipment and substations; transit malls; transfer facilities; intermodal terminals; shelters; passenger stations; depots; terminals; high-occupancy vehicle facilities; transit ways; park-and-ride facilities; vehicle diagnostic equipment; real-time data acquisition systems; computer hardware and software; and fare collection equipment.

In the aggregate, rolling stock represents 22.3 percent of capital expenditures, while facilities and other represent 77.7 percent. Rail modes consume the majority of capital expenditures. Heavy rail, commuter rail, and light rail expended 71 percent of the capital investment in 1994.

Rail modes are mostly located in high density corridors in the largest metropolitan areas of the United States. The high levels of service supplied required to meet the demand in these areas require large investments in items such as real-time data acquisition systems, complex maintenance facilities, passenger stations, intermodal terminals, and many other cost-intensive items. The nature of the rail systems explains the smaller role of the share of rolling stock in the total capital expenditure of rail modes. Heavy rail expended 10.3 percent of capital on rolling stock in 1994, while commuter rail and light rail expended 16.3 and 10.8 percent, respectively.

Bus and demand response demonstrate a different share in the distribution of capital expenditures among rolling stock, facilities, and other. Bus expended 45.3 percent of the capital invested on rolling stock, while demand response's share was 70 percent in 1994. Bus and demand response modes do not require the same level of investment in facilities and other as do rail modes; therefore, rolling stock is the main use of capital. Additionally, while rail modes are concentrated in large UZAs serving dense metropolitan areas, bus

systems operate in large, mid-size and small UZAs, and the total capital expenditure for bus is distributed among several transit agencies across the nation. Mid-size and small UZAs contribute 22 percent of the uses of capital funding for bus. The share of rolling stock in these areas is even higher than the share for large urbanized areas. This fact contributes to the overall larger share of rolling stock for bus. Demand response displays an even higher percentage of capital expenditures for rolling stock, because capital items, such as intermodal terminals and shelters, have some relevance for bus systems, especially in large UZAs, but not for demand response systems.

Exhibit 51 lists the 20 largest users of capital funds and reflects the substantial investment in facilities and other capital expenditures for rail modes. These 20 transit agencies accounted for 72 percent of all capital spending in 1994.

Exhibit 51

Twenty Largest Users of Capital Funds
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA	$8,446.5	$84,006.9	$92,453.4
CA	LA-SCRRA	8,367.4	177,496.9	$185,864.3
CA	San Francisco-BART	24,232.5	348,372.9	$372,605.4
CA	SF-CALTRANS	47,764.8	61,417.2	$109,182.0
CO	Denver-RTD	23,902.4	69,203.1	$93,105.5
DC	Washington-WMATA	79,037.5	199,175.0	$278,212.5
GA	Atlanta-MARTA	4,131.3	81,118.4	$85,249.7
IL	Chicago-RTA-CTA	35,413.0	198,495.0	$233,908.0
IL	Chicago-RTA-Metra	65,548.6	151,692.7	$217,241.3
MA	Boston-MBTA	37,969.4	240,670.0	$278,639.4
MD	Baltimore-Maryland-MTA	15,848.3	78,386.6	$94,234.9
NJ	New Jersey Transit	123,113.3	173,839.2	$296,952.5
NY	NY-MTA-Long Island RR	5,498.9	195,121.5	$200,620.4
NY	NY-MTA-Metro North RR	16,955.6	127,837.8	$144,793.4
NY	NY-MTA-NYCTA	54,632.4	836,629.7	$891,262.1
OR	Portland-Tri-Met	14,441.5	107,842.8	$122,284.3
PA	Philadelphia-SEPTA	55,777.9	180,915.5	$236,693.4
TX	Dallas-DART	18,922.0	206,112.0	$225,034.0
TX	Houston-Metro	33,571.9	77,063.9	$110,635.8
WA	Seattle-Washington DOT	50,285.9	32,849.6	$83,135.5
	Total	$673,575.2	$3,355,611.0	$4,029,186.2

Exhibits 52 through 58 provide capital investment information for individual transit modes by category of use except for demand response. The 15 largest bus systems given in **Exhibit 52** reflect a significant investment of their capital funds in facilities and other expenditures, accounting for nearly 51 percent of the total national capital investment for this capital expenditure category.

Exhibit 52

Uses of Bus Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA	$7,373.5	$73,979.3	$81,352.8
CO	Denver-RTD	21,071.2	34,880.5	$55,951.7
DC	Washington-WMATA	6,508.5	6,183.2	$12,691.7
IL	Chicago-RTA-CTA	10,286.6	43,865.8	$54,152.5
MA	Boston-MBTA	-	383.0	$383.0
MD	Baltimore-Maryland-MTA	21.1	7,706.1	$7,727.2
MN	Minneapolis-St. Paul-MTC	26,896.1	11,926.6	$38,822.6
NJ	New Jersey Transit	41,309.1	37,965.2	$79,274.3
NY	NY-MTA-NYCTA	25,660.4	35,662.7	$61,323.1
NY	New York City DOT	40,091.2	8,925.4	$49,016.6
PA	Philadelphia-SEPTA	13,398.9	8,816.6	$22,215.5
PA	Pittsburgh-PAT	32,501.3	30,835.9	$63,337.2
TX	Houston-Metro	33,571.9	75,950.2	$109,522.0
TX	Dallas-DART	6,282.4	16,791.4	$23,073.8
WA	Seattle-Metro	1,773.3	27,213.9	$28,987.2
	Total	$266,745.6	$421,085.8	$687,831.4
	Percent of National Bus Total	43.6%	57.2%	51.0%

Uses of capital funds for heavy rail are presented in **Exhibit 53**. It shows the significant share of the New York City Transit Authority in the total capital expenditures for heavy rail, with 40 percent of the total capital expenditures.

Exhibit 53

Uses of Heavy Rail Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA	$0.0	$5,626.5	$5,626.5
CA	San Francisco-BART	24,232.5	348,372.9	$372,605.5
DC	Washington-WMATA	72,528.9	192,991.8	$265,520.7
FL	Miami-MDTA	1,148.5	3,849.0	$4,997.5
GA	Atlanta-MARTA	2,931.7	76,294.6	$79,226.4
HI	Honolulu-DTS	0.0	4,532.2	$4,532.2
IL	Chicago-RTA-CTA	25,126.3	154,629.3	$179,755.6
MA	Boston-MBTA	34,414.7	58,302.0	$92,716.7
MD	Baltimore-MDOT	883.2	57,993.5	$58,876.7
NY	NY-MTA-NYCTA	28,972.0	800,967.0	$829,939.1
NY	NY-MTA-Staten Island	0.0	4,229.5	$4,229.5
NY	Port Authority-PATH	0.0	37,246.0	$37,246.0
OH	Cleveland-RTA	175.1	15,404.1	$15,579.3
PA	Philadelphia-PATCO	858.8	2,825.6	$3,684.4
PA	Philadelphia-SEPTA	21,345.3	94,185.6	$115,530.9
	Total	$212,617.1	$1,857,449.6	$2,070,066.9

Uses of capital funds for commuter rail are presented in **Exhibit 54**. It shows the significant share of agencies such as Chicago Metra, New Jersey Transit, and Long Island Rail Road in the total capital expenditures for commuter rail. These three agencies expended 45.8 percent of the total capital expenditures for commuter rail in 1994. Philadelphia-Penn Department of Transportation was the only commuter rail agency without capital expenditures in 1994.

Exhibit 54

Uses of Commuter Rail Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-SCRRA	$8,367.4	$177,496.9	$185,864.3
CA	SF-CALTRANS	0.0	2,537.1	$2,537.1
CA	San Diego-NCTD	16,105.1	21,518.3	$37,623.4
CA	San Jose-SCCTD	0.0	17,016.6	$17,016.6
CT	Hartford-Conn DOT	1,500.0	60,027.0	$61,527.0
FL	Ft. Lauderdale-TCRA	162.7	7,408.6	$7,571.3
IL	Chicago-RTA-Metra	65,548.6	151,692.7	$217,241.3
IN	NW IN-NICTD	143.3	5,487.5	$5,630.8
MA	Boston-MBTA	3,173.5	161,512.6	$164,686.1
MD	Baltimore-Maryland-MTA	11,679.8	7,128.5	$18,808.3
NJ	New Jersey Transit	81,334.8	135,512.1	$216,846.8
NY	NY-MTA-Long Island RR	5,498.9	195,121.5	$200,620.4
NY	NY-MTA-Metro North RR	16,955.6	127,837.8	$144,793.4
PA	Philadelphia-SEPTA	15,901.5	77,251.4	$93,152.9
TX	Dallas-DART	0.0	3,629.7	$3,629.7
TX	Houston-Metro	0.0	701.9	$701.9
VA	VA-VRE	226.5	7,937.6	$8,164.2
	Total	$226,597.8	$1,159,817.6	$1,386,415.4

Uses of capital funds for light rail are presented in **Exhibit 55.** Dallas and Portland were the agencies with the greatest capital expenditures for light rail in 1994. These two agencies together accounted for 58.8 percent of all capital expenditures, as Dallas is building a system and Portland is building a major expansion.

Uses of capital funds for trolleybus are presented in **Exhibit 56.** San Francisco-Muni was the agency with the greatest share of capital expenditures among trolleybus agencies, with 60.6 percent. Philadelphia SEPTA was the only trolleybus operator that did not have any capital expenditure for this mode in 1994.

Exhibit 55

Uses of Light Rail Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA/SCRTD	$0.0	$1,547.3	$1,547.3
CA	Sacramento-RT	0.0	9,125.8	$9,125.8
CA	San Francisco-Muni	17,020.8	55,974.5	$72,995.3
CA	San Jose-SCCTD	0.0	30,081.3	$30,081.3
CO	Denver-RTD	978.4	34,264.7	$35,243.1
LA	New Orleans-RTA	3,618.4	0.0	$3,618.4
MA	Boston-MBTA	381.2	4,360.4	$4,741.6
MD	Baltimore-Maryland-MTA	3,264.2	5,558.6	$8,822.8
MO	St. Louis-Bi-State	1,686.4	16,067.1	$17,753.5
NC	Charlotte-CTS	0.0	189.1	$189.1
NJ	New Jersey Transit	469.5	361.9	$831.4
NY	Buffalo-NFTA	0.0	37.9	$37.9
OH	Cincinnati-SORTA	0.0	3,302.3	$3,302.3
OH	Cleveland-RTA	0.0	1,684.8	$1,684.8
OR	Portland-Tri-Met	10,855.4	97,872.6	$108,728.0
PA	Philadelphia-SEPTA	5,132.1	661.9	$5,794.0
PA	Pittsburgh-PAT	54.2	9,442.4	$9,496.6
TN	Memphis-MATA	330.0	701.9	$1,031.9
TX	Austin-Capital Metro	0.0	11.8	$11.8
TX	Dallas-DART	12,639.6	185,690.9	$198,330.5
UT	Salt Lake City-UTA	0.0	882.0	$882.0
WA	Seattle-Metro	0.0	8,029.8	$8,029.8
	Total	$56,430.1	$465,849.2	$522,279.3

Exhibit 56

Uses of Trolleybus Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	San Francisco-Muni	$29,857.2	$4,956.8	$34,813.9
MA	Boston-MBTA	0.0	16,112.0	$16,112.0
OH	Dayton-RTA	977.4	1,555.4	$2,532.8
PA	Philadelphia-SEPTA	0.0	0.0	$0.0
WA	Seattle-Metro	375.6	3,564.2	$3,939.8
	Total	$31,210.2	$26,188.4	$57,398.6

Uses of capital funds for ferryboat agencies are presented in **Exhibit 57.** The Washington Department of Transportation (Seattle) demonstrates a significant share of capital expenditures for ferryboat agencies in 1994, with 76.2 percent. Several ferryboat operators did not report any capital expenditure in 1994. These agencies are Kitsap Transit, Norfolk-TRT, NY Port Authority- PATH, MBTA-Boston, Connecticut Department of Transportation, and Oakland-Vallejo San Francisco Ferry Service.

Exhibit 57

Uses of Ferryboat Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	Oakland-AOFS	$4,137.6	$243.5	$4,381.0
CA	SF-Golden Gate	0.0	292.0	$292.0
LA	New Orleans-Cresent City	1,518.5	47.4	$1,565.9
ME	Portland-CBL	720.0	37.5	$757.5
NY	New York City DOT	9.7	15,221.3	$15,231.0
PR	San Juan-Port Authority	0.0	959.4	$959.4
WA	Seattle-Washington DOT	50,285.9	32,849.6	$83,135.5
WA	Tacoma-Pierce Ferry	2,439.5	314.9	$2,754.4
	Total	$59,111.2	$49,965.5	$109,076.8

Uses of capital funds for automated guideway agencies are depicted in **Exhibit 58**. Only one automated guideway operator, Tampa Hartline, did not report capital expenditures in 1994.

Exhibit 58

Uses of Automated Guideway Capital Funds by Transit Agencies
(Thousands)
1994

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
FL	Jacksonville-JTA	$0.0	$11,161.9	$11,161.9
FL	Miami-MDTA	23.8	16,952.6	$16,976.4
MI	Detroit-DTC	6,903.6	0.0	$6,903.6
	Total	$6,927.4	$22,862.8	$35,041.9

Current Infrastructure: Fixed Guideway Characteristics

Exhibit 59 reflects the amount of fixed guideway segment miles by mode and demonstrates the continuing investment in the development and operation of fixed guideway systems. For the bus mode, both exclusive and controlled access rights-of-way are included. The continuing investment in fixed guideway systems is most prominent for bus, which has increased fixed guideway segment miles by 34.6 percent since 1991. The bus fixed guideway segment miles reported are for the actual segments being operated. Many bus fixed guideway segments are utilized by more than one transit agency. Each transit agency is required to report its operation on each segment. However, **Exhibit 59** only includes the actual segments as measured in miles. Prior to 1991, these data were reported in a manner that did not avoid double counting. Therefore, this exhibit includes the period

Exhibit 59

Fixed Guideway Miles by Mode
(Actual Segments)
1991-1994

Mode	1991	1992	1993	1994
Bus*	712.2	790.2	925.6	958.7
Heavy Rail	1,368.7	1,403.2	1,451.7	1,455.2
Commuter Rail	5,056.3	5,306.7	5,875.1	6,033.4
Light Rail	556.0	562.9	537.4	561.9
Demand Response	-	-	-	-
Other - Ferryboat	454.1	459.0	475.6	486.5
- Trolleybus	375.9	394.5	405.2	416.9
- All other	24.1	20.7	21.7	26.5
Total	8,547.3	8,937.2	9,692.3	9,939.1

* Exclusive plus Controlled Access Rights-of-Way.

1991 through 1994, and it will be continued in subsequent editions of the *National Transit Summaries and Trends*.

For the rail modes, increases were reported for heavy rail, commuter rail, and light rail. These increases reflect new starts and the expansion of existing systems with the opening of new segments. Heavy rail indicates an increase of 6.3 percent for the 1991-1994 timeframe. The increase in commuter rail is more noticeable, as it increased by 19.3 percent. Light rail had an increase of 1.1 percent during the 1991-1994 timeframe and new starts took place during this period. In 1994, new systems in Denver and St. Louis added new fixed guideway directional route miles for light rail. The small increase of 1.1 percent for the 1991-1994 timeframe is explained by the discontinuation of some light rail lines in Philadelphia. Demand response is not a fixed guideway mode and, therefore, does not have any fixed guideway miles.

The 15 bus systems with the greatest number of fixed guideway segment miles are displayed in **Exhibit 60** and account for almost 82.5 percent of fixed guideway segment

Exhibit 60

Miles of Fixed Guideway Segments Utilized by Selected Bus Systems*
1994

ST	System Name	Exclusive Directional Route Miles	Controlled Access Directional Route Miles	Total Fixed Directional Route Miles	Segments or Portions Thereof Utilized by Other Transit Agencies
AZ	Phoenix-PTD	41.9	0.0	41.9	
CA	LA-LACMTA/SCRTD	24.5	0.0	24.5	X
CA	San Jose-SCCTD	0.0	106.4	106.4	
CA	SF-Golden Gate	0.0	20.5	20.5	
CO	Denver-RTD	9.9	12.5	22.4	
CT	Hartford-CT Transit	27.4	0.0	27.4	X
DC	Washington-WMATA	0.0	45.9	45.9	X
FL	Miami-MDTA	0.0	22.3	22.3	X
HI	Honolulu-DTS	1.2	20.0	21.2	
MN	Minneapolis-St. Paul-MTC	24.9	65.5	90.4	
NY	NY-MTA-NYCTA	2.6	36.2	38.8	X
PA	Pittsburgh-PAT	41.3	0.0	41.3	X
TX	Houston-Metro	127.4	4.0	131.4	X
VA	Norfolk-TRT	0.0	32.5	32.5	
WA	Seattle-Metro	118.9	5.4	124.3	X
	Subtotal	420.0	371.2	791.2	
	All Other Systems	73.7	93.8	167.5	
	Total	493.7	465.0	958.7	

* Transit agencies with the greatest amount of total fixed guideway directional route miles.

miles. One reason for the growth in bus fixed guideway segments is the inclusion of high occupancy vehicle lanes in urban freeway designs and construction. Also, some fixed guideway applications, such as controlled access rights-of-way, can be implemented with minimal capital investment.

Vehicle Availability

The number of vehicles available for maximum service by mode and by type of service is reflected in **Exhibit 61**. In addition, the number of vehicles that meet the Americans with Disabilities Act (ADA) regulations is included. Heavy rail is the mode with the highest percentage of ADA accessible vehicles, with 78.6 percent of vehicles in that category. Demand response directly operated is the mode with the second highest percentage of ADA accessible vehicles, with 75.3 percent, while only 45.3 percent of demand response purchased transportation vehicles are ADA accessible. This is due mainly to the large number of taxicabs being used for demand response service. There is a strong

Exhibit 61

Vehicles Available for Maximum Service and ADA Accessible by Mode and Type of Service 1994

Modes/Type of Service	Vehicles	ADA Accessible Vehicles	Percent Available
Buses			
Directly Operated	49,745	26,349	53.0%
Purchased Transportation*	3,975	2,280	57.3%
Total	53,720	28,629	53.3%
Heavy Rail			
Directly Operated	10,282	8,086	78.6%
Purchased Transportation*	0	0	0.0%
Total	10,282	8,086	78.6%
Commuter Rail			
Directly Operated	4,454	695	15.6%
Purchased Transportation*	672	248	36.9%
Total	5,126	943	18.4%
Light Rail			
Directly Operated	1,031	375	36.4%
Purchased Transportation*	0	0	0.0%
Total	1,031	375	36.4%
Demand Response			
Directly Operated	3,716	2,800	75.3%
Purchased Transportation*	13,731	6,214	45.3%
Total	17,447	9,014	51.7%
Other			
Directly Operated	2,388	361	15.1%
Purchased Transportation*	2,442	37	1.5%
Total	4,830	398	8.2%

* Purchased transportation data are partial because directly operated includes some purchased transportation data. Refer to Exhibit 5 in the Introduction.

correlation between the number of vehicles that are ADA accessible and the vehicle's fleet age. Light rail and commuter rail have a small percentage of ADA accessible vehicles and have an older fleet age. Many vehicles for these modes were manufactured before the implementation of ADA regulations and were not fully adapted to be considered ADA accessible vehicles.

It can also be seen in **Exhibit 61** that bus and demand response are the modes with the largest percentage of purchased transportation vehicles. It should be noted that this number is even higher since the purchased transportation reported as directly operated service is considered only as directly operated and not as purchased transportation, as explained in the Introduction to this publication.

Spare Ratio

Exhibit 62 reflects the relative stability of spare ratios for each mode since 1990, with the exception of light rail. The spare ratio for light rail increased by 18.4 percent compared with 1993. This increase is related to the gap between the number of new vehicles acquired to meet projected ridership and the current real demand for light rail services for new starts. Demand response is the mode with the highest spare ratio among modes, with 36 percent, followed by light rail, with 34.1 percent.

Exhibit 62

Spare Ratio by Mode for Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	23.0%	24.1%	22.5%	23.0%	22.9%
Heavy Rail	23.6	25.5	25.1	25.6	24.2
Commuter Rail	16.7	16.9	17.6	18.2	17.9
Light Rail	35.6	25.3	32.4	28.8	34.1
Demand Response	24.7	25.4	25.5	35.1	36.0

Average Fleet Age

The average fleet age by mode for the 1990-1994 timeframe is provided in **Exhibit 63**. The average fleet age increased slightly in 1994 for all modes, with the exception of light rail and demand response, which remained unchanged in 1994. The average fleet age for bus, heavy rail, and commuter rail increased 2.4, 4.5, and 2.1 percent, respectively. It should be noted that capital investment and uses of capital decreased for all modes except light rail, which experienced new start ups in 1994. The smaller capital expenditures in rolling stock reflect an increased fleet age for bus, heavy rail, and commuter rail.

Exhibit 63

Average Fleet Age (Years) by Mode for Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	9.0	8.0	8.3	8.3	8.5
Heavy Rail	17.0	17.0	17.8	17.8	18.6
Commuter Rail	18.0	17.0	18.5	18.8	19.2
Light Rail	16.0	16.0	17.1	14.3	14.3
Demand Response	4.0	4.0	3.4	3.7	3.7

Non-Fixed Guideway Vehicles

Non-fixed guideway vehicles by vehicle type, by mode, and by type of service are presented in **Exhibit 64**. Over 88 percent of vehicles operated in bus service are high capacity coaches, seating more than 35 passengers. In contrast, nearly 40 percent of demand response vehicles are vans, while over 39 percent are automobiles.

Exhibit 64

Non-Fixed Guideway Vehicles by Vehicle Type, Mode, and Type of Service 1994

Vehicle Type	Bus		Demand Response	
	Directly Operated	Purchased Transportation	Directly Operated	Purchased Transportation
Class A Bus (>35 Seats)	46,162	2,866	37	24
Class B Bus (25-35 Seats)	3,202	480	113	43
Class C Bus (<25 Seats)	999	548	1,731	1,731
Articulated Bus	1,626	48	15	0
School Bus	95	13	16	67
Van	83	103	1,799	5,450
Automobile	0	3	134	6,993
Total	52,167	4,061	3,845	14,308

Non-fixed guideway vehicles by vehicle type and by propulsion are demonstrated in **Exhibit 65**. The exhibit shows that, while other forms of propulsion are growing in acceptance, diesel fuel-powered vehicles and gasoline-powered vehicles continue to account for 78.9 percent and 18.4 percent, respectively, for all non-fixed guideway vehicles. Other means of propulsion, including electricity, liquefied natural gas, compressed natural gas, and liquefied petroleum gas, account for the remaining 3.2 percent.

Exhibit 65

Non-Fixed Guideway Vehicles by Vehicle Type and Propulsion 1994

Vehicle Type	Diesel Fuel	Gasoline	Other Fuels	Total
Class A Bus (>35 Seats)	47,769	21	1,295	49,085
Class B Bus (25-35 Seats)	3,645	70	123	3,838
Class C Bus (<25 Seats)	3,183	1,342	414	4,939
Articulated Bus	1,635	0	54	1,689
School Bus	168	23	0	191
Van	1,814	5,188	430	7,432
Automobile	24	6,919	71	7,014
Total	58,238	13,563	2,387	74,188

New Vehicles Acquired

A summary of new vehicles acquired by mode and by type of service for 1994 is presented in **Exhibit 66**. Data for 1994 in this exhibit reflect only the number of new vehicles acquired within the report year. Since a transit agency's report year is based on its fiscal year, data for 1994 are limited to that portion of the manufacturer year included within the transit agency's fiscal year. For example, a transit agency with a fiscal year ending on June 30 will report only the new vehicles accepted and placed into service at the end of June 30. As a result, a vehicle manufactured in a given year, but accepted after the transit agency's fiscal year ends, will not be reported until the subsequent report year for that

transit agency. One half of all transit agencies conclude their fiscal year on June 30. As a result, current year data will understate the number of new vehicles for 1994.

Due to the fact that **Exhibit 66** reflects only a portion of new vehicles acquired in 1994, the analysis of the data should be limited to the 1990-1993 timeframe and only what appears to be the full prospects for 1994. The total number of vehicles acquired in 1993 remained stable in relation to 1992, with a minimal decrease of 2 percent in 1993. New vehicles for bus declined by 9.2 percent in 1993 when compared with 1992. Rail modes remained stable in 1993, with the exception of commuter rail, which suffered a decrease of 29.8 percent in new vehicles acquired. The most striking aspect of **Exhibit 66** is the increase for demand response in 1993. New vehicles acquired increased by 54 percent in relation to 1992 for demand response. Bus accounted for 54 percent of all new vehicles acquired in 1993, while demand response accounted for 34 percent. Rail modes accounted for 6.5 percent of new vehicles for that year.

The partial data for 1994 appears to indicate that demand response will again display a large increase in new vehicles acquired. The reason is that the partial figure reported for 1994 is only slightly less than the total for 1993, while there remains a significant amount of data to be reported upon completion of the 1995 Report Year. The partial data for 1994 also reveal that bus accounts for 40.4 percent of new vehicles acquired and demand response accounts for 46.6 percent.

New Vehicles Acquired by Mode and Type of Service
1990-1994

Exhibit 66

Modes/Type of Service	1990	1991	1992	1993	1994
Buses					
Directly Operated	3,836	2,396	2,647	2,564	1,199
Purchased Transportation	239	455	379	183	207
Total	4,075	2,851	3,026	2,747	1,406
Heavy Rail					
Directly Operated	14	-	215	226	20
Purchased Transportation	-	-	-	-	-
Total	14	0	215	226	20
Commuter Rail					
Directly Operated	46	71	35	13	-
Purchased Transportation	-	39	59	53	18
Total	46	110	94	66	18
Light Rail					
Directly Operated	32	14	34	38	-
Purchased Transportation	-	-	-	-	-
Total	32	14	34	38	-
Demand Response					
Directly Operated	495	512	353	518	395
Purchased Transportation	802	857	781	1,228	1,226
Total	1,297	1,369	1,134	1,746	1,621
Other					
Directly Operated	403	284	575	211	254
Purchased Transportation	30	30	99	44	161
Total	433	314	674	255	415
Total					
Directly Operated	4,826	3,277	3,859	3,570	1,868
Purchased Transportation	1,071	1,381	1,318	1,508	1,612
Total	5,897	4,658	5,177	5,078	3,480

Another perspective on fleet age is provided in **Exhibit 67**. Comparisons with **Exhibit 66** should be avoided because **Exhibit 67** provides data by fleet type, while **Exhibit 66** provides information by mode. Each of the vehicle types enjoys a different useful life greatly influenced by use, weather, road conditions, maintenance practices, and local policies regarding rehabilitation and overhaul. Thus, the decline in average age is reflected in the number of standard buses, small buses, and vans that are 5 years of age or less, while the longer useful lives of heavy rail, commuter rail, and light rail vehicles are reflected by the large number of vehicles that are more than 15 years old.

Exhibit 67

Vehicles by Age and Vehicle Type
Directly Operated Service
1994

Vehicle Type	Age in Years						Total
	5 Years or Less	6-11 Years	12-15 Years	16-20 Years	21-25 Years	Over 25 Years	
Buses							
Class A Bus (>35 Seats)	13,982	17,258	9,245	2,428	724	500	44,137
Class B Bus (25-35 Seats)	1,549	933	553	129	36	1	3,201
Class C Bus (<25 Seats)	1,890	682	46	8	-	-	2,626
Articulated Bus	221	740	473	131	-	-	1,565
School Bus	102	6	1	2	-	-	111
Heavy Rail	514	3,115	714	1,416	1,192	3,202	10,153
Commuter Rail	404	800	217	782	1,527	919	4,649
Light Rail	139	301	212	218	2	97	969
Van/Auto	3,073	444	8	1	-	-	3,526
Total	21,874	24,279	11,469	5,115	3,481	4,719	70,937

Chapter 5
Operating Funding and Expenses

Introduction

This chapter discusses patterns and trends of funding and expenditures for transit operations. Sources and levels of such funding are outlined, as well as general trends for operating funding and expenses. Operating expenses are presented and discussed by mode and object class. The National Transit Database (NTD) uses accrual accounting as the basis for financial reporting. This means that funds reported are funds that were applied in the reporting year and that result in liabilities for benefits received, regardless of whether or not payment of the expenditure is made during the reporting period.

Chapter Organization

The chapter begins with a review of the various funding sources (Federal, State, and local assistance, as well as passenger fare revenues). Operating expenses are then presented by mode and object class.

Operating Funds Applied

Operating funds include Federal, State, and local financial assistance used for subsidizing the cost of operating transit services, as well as all categories of passenger fare revenues. Operating funds applied are not available by mode in the NTD. One of the reasons for this limitation is related to the integrated fare policy found in large transit systems operating more than one mode. Federal funds include general grants of operating assistance funds under 49 United States Code 5307 (formerly Section 9, of the Federal Transit Act, as amended) and other grants that have an operating assistance component. State funds include direct operating grants, as well as assistance to transit agencies to encourage reduced fares for the elderly and physically challenged. Local assistance, besides municipal appropriations, incorporates funds available from dedicated taxes (property, sales, income, or other); tolls and fees; revenues accrued through purchased transportation agreements; and other non-fare-based revenue sources such as concessions and advertising.

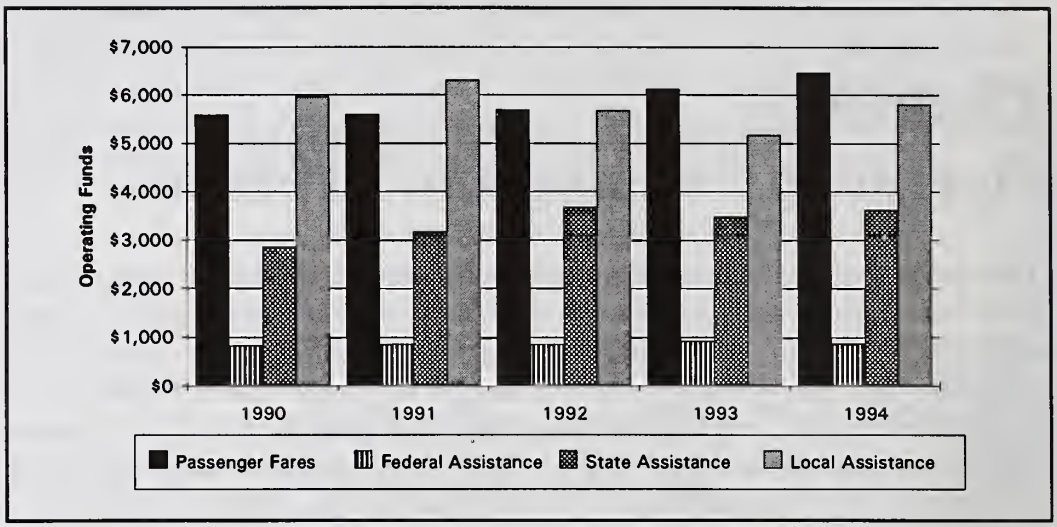
A reporting change was introduced in 1994 for operating funds applied. For 1994, only the funds expended in the reporting year were reported. Previously, all funds collected were reported regardless whether or not they were expended in the reporting year. Therefore, variations in the amounts of funds by source from 1993 to 1994 may be affected by this reporting change.

Sources of Operating Funding

As shown in **Exhibit 68**, passenger fares and local funds compose the bulk of operations funding. In 1994, fares contributed 37.3 percent of the funds applied for transit operations, while local assistance contributed 33.5 percent. State operating assistance accounted for 21 percent, while Federal funds supplied slightly under 5 percent.

Exhibit 68

Sources of Operating Funds
(Millions)
1990-1994



Operating funds applied increased 3.5 percent in 1994 compared with 1993. The contribution of passenger fares, and State and local assistance increased in 1994, while Federal assistance decreased by 5.6 percent.

For the 1990-1994 timeframe, passenger fares as a percentage of operating funds applied remained very stable, ranging from 36.7 percent in 1990 to 37.3 percent in 1994. The contribution of local assistance also remained very stable, ranging from 33.3 percent in 1990 to 33.5 percent in 1994. It should be noted, however, that in 1994, local assistance included some sources of funding that were accounted as "other" funds in previous years. These sources of funds applied are revenues accrued through a purchased transportation agreement and subsidies from other sectors of the operation which were considered as "other" funds from 1990 to 1993. These two sources represent 3.1 percent of the total operating funds in 1994. Federal assistance accounted for 18.8 percent of the total operating funds in 1990 and decreased to 4.9 percent in 1994. State assistance, on the other hand, increased from 18.8 percent in 1990 to 20.9 percent in 1994.

Sources of Operating Funds Applied by UZA Size

The distribution of transit operating funds applied from the various sources available by size of urbanized area is outlined in **Exhibit 69**. While the trend in transit operating funds applied has been a decreased role for Federal funding and an increased role from other sources, there is a variation among the different sizes of urbanized areas. For small urbanized areas, Federal funding decreased from 21.1 percent in 1990 to 19.1 percent in 1994. For mid-size urbanized areas, the decline in the share of Federal funding was higher, from 14 percent in 1990 to 10.9 percent in 1994, totalling a 3.1 percent decrease. This decline was compensated for by increases in State and local assistance which increased 3.2 and 4.6 percent, respectively, for the 1990-1994 timeframe. State and local assistance also increased for small urbanized areas from 1990 to 1994, but at a slower rate. State and local assistance grew by 1.8 percent and .2 percent, respectively, for small urbanized areas between 1990 and 1994.

Exhibit 69

Sources of Operating Funds by UZA Size
(Millions)
1990-1994

UZA Size	Year	Passenger Fares	Federal Assistance	State Assistance	Local Assistance	Other	Total
Under 200,000	1990	$86.9	$88.3	$92.2	$132.6	$17.9	$417.9
	1991	93.3	91.7	107.2	140.5	19.8	$452.5
	1992	96.7	97.0	113.2	152.2	24.6	$483.7
	1993	111.7	102.5	114.6	168.3	23.4	$520.5
	1994	120.5	105.1	131.9	176.0	17.7	$551.2
200,000 to 1 Million	1990	288.7	159.5	172.7	472.7	43.4	$1,137.0
	1991	305.6	168.6	270.3	509.6	46.2	$1,300.3
	1992	303.6	165.4	232.5	579.5	49.7	$1,330.7
	1993	320.0	168.7	273.8	588.7	70.0	$1,421.2
	1994	328.3	164.5	276.5	694.3	40.0	$1,503.6
Over 1 Million	1990	5,216.7	573.7	2,593.4	4,462.5	833.5	$13,679.8
	1991	5,200.6	589.7	2,796.0	4,741.5	863.1	$14,190.9
	1992	5,297.0	586.7	3,335.0	4,100.9	773.9	$14,093.5
	1993	5,685.3	641.9	3,086.7	4,408.5	993.8	$14,816.2
	1994	6,017.6	591.9	3,218.3	4,945.1	516.9	$15,289.8
Total	1990	$5,592.5	$821.5	$2,858.2	$5,067.7	$894.8	$15,234.7
	1991	$5,599.4	$850.0	$3,173.5	$5,391.7	$929.1	$15,943.7
	1992	$5,697.3	$849.1	$3,680.6	$4,832.6	$848.2	$15,907.8
	1993	$6,117.1	$913.0	$3,475.1	$5,165.5	$1,087.2	$16,757.9
	1994	$6,466.4	$861.5	$3,626.7	$5,815.4	$574.7	$17,344.7

For large urbanized areas, a decline in the share of Federal funding is also observed, while the contribution of State funds displays the same trend of growth for small and mid-size urbanized areas. Local assistance remained stable, contributing 32.3 percent of the operating funds in 1994.

The contribution of passenger fares to total operating funds applied has different trends depending on the size of the urbanized area. For small urbanized areas, the share of passenger fares increased 1 percent from 1990 to 1994. In 1990, passenger fares represented 20.8 percent of the total operating funds applied, while this figure goes up to 21.8 percent in 1994. For mid-size urbanized areas, there is a sharp decrease in the share of passenger fares for the 1990-1994 timeframe. While passenger fares accounted for 25.4 percent of the operating funds in 1990, in 1994, this figure dropped to 21.8 percent, with a net decrease of 3.6 percent. For large urbanized areas, the contribution of passenger fares increased from 38.1 percent in 1990 to 39 percent in 1994.

Operating Expense

The total operating expenses for 1994 increased by over 5.4 percent compared with 1993, resulting in over $16.3 billion in expenditures. Total operating funding for 1994 was over $17.3 billion and greater than the total operating expenses because of reconciling items that were reported but vary in treatment as a result of local ordinances and conditions. These items are used to reconcile NTD expenses with public financial reports. Reconciling items include interest expenses, leases and rentals, purchase and related parties lease agreements, and other. Depreciation is also reported as a reconciling item; but, because it is not a cash expenditure, it is not included in the computation of the total reconciling cash expenditures. Total reconciling cash expenditures were over $961 million in 1994.

Total operating expenses increased 10.9 percent from 1990 to 1994, as shown in **Exhibit 70**. The consumer price index increased 13.2 percent for this period, indicating that total operating expense for public transit has been maintained below inflation.

Exhibit 70

Operating Expense by Mode and Reconciling Cash Expenditures
(Millions)
1990-1994

Mode	1990	1991	1992	1993	1994	Difference 1990-1994
Bus	$7,789	$8,330	$8,625	$8,514	$8,860	13.7%
Heavy Rail	3,825	3,841	3,555	3,669	3,786	(1.0)
Commuter Rail	2,157	2,175	2,170	2,080	2,228	3.3
Light Rail	236	290	307	314	412	74.4
Demand Response	386	443	500	540	634	64.2
Other	323	325	342	356	401	24.1
Operating Expenses	$14,716	$15,404	$15,499	$15,473	$16,320	10.9%
Reconciling Cash Expenditures	$726	$908	$1,064	$914	$961	32.4%

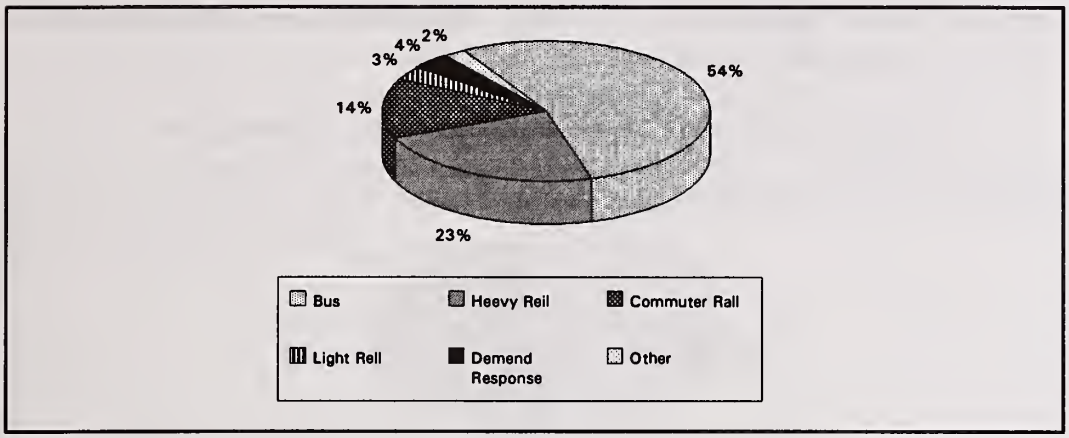
It should be noted that operating expense reported by agencies was not fully allocated by function and object class in 1990 and 1991. Joint expenses were reported separately for agencies operating more than one mode in 1990 and 1991, although multi-modal agencies were encouraged to allocate joint expenses by function and object class to each mode to the maximum possible extent. Starting in 1992, full allocation of joint expenses by mode, function, and object class became mandatory. Therefore, reported operating expense by mode from 1992 on reflects more accurately the real costs of transit modes in the United States because joint expenses are fully allocated.

Upon examination of total operating expenses by mode, demand response and light rail experienced the highest increases for the 1990-1994 timeframe. Operating expenses for demand response and light rail increased by over 62 and 74 percent, respectively. These increases reflect expansion of the service supplied by these modes and implementation of new light rail systems across the nation. Commuter rail experienced a small increase in operating expenses. Heavy rail is the only mode with a decrease for the 1990-1994 timeframe. The increase for bus was 13.7 percent and reflects the moderate increase in service supplied for this mode in the last 5 years.

The contribution of each mode to total operating expense in 1994 is displayed in **Exhibit 71**, which reflects the dominance of bus services, which accounted for 54 percent of the 1994 total operating expenses. Heavy rail consumed over 23 percent and commuter rail represents over 13 percent. Demand response and light rail, while increasing in the amount of service supplied and in operating expense, represent less than 4 percent and slightly over 2 percent, respectively, of total operating expenses for 1994.

Distribution of Total Operating Expense by Mode 1994

Exhibit 71



Object Classes and Functions

Operating expenses are reported by object class and function in the NTD. Object classes are groupings of expenses on the basis of goods or services purchased. The following are the items included as object classes in the NTD:

- Labor,
- Fringe Benefits,
- Services,
- Materials and Supplies,
- Utilities,
- Casualty and Liability Costs,
- Taxes,
- Purchased Transportation,
- Miscellaneous Expenses, and
- Expense Transfers.

A function represents the activities associated with accomplishing a certain task. The following are the four functional categories used for reporting:

- Vehicle Operations,
- Vehicle Maintenance,
- Non-vehicle Maintenance, and
- General Administration.

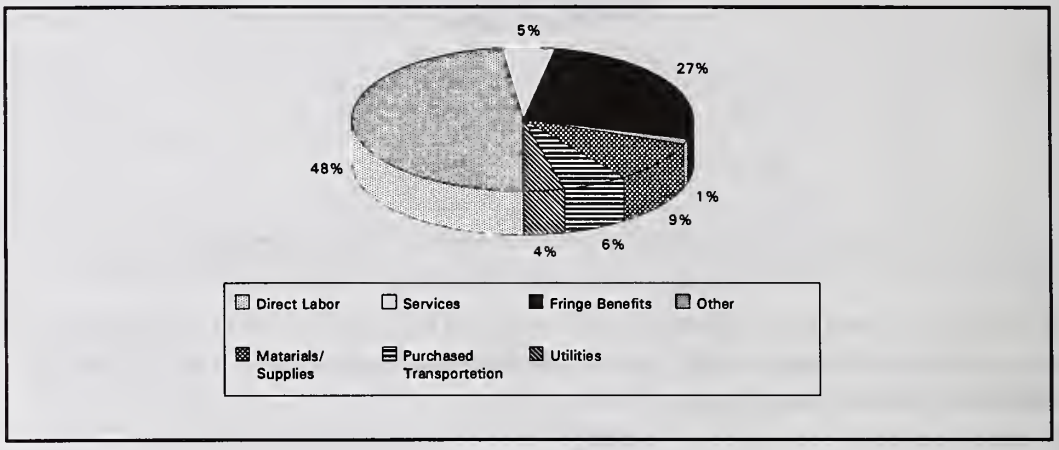
For this publication, casualty and liability costs, taxes, miscellaneous expenses, and expense transfers are grouped together as "other" when operating expense by object class is discussed. Operating expense by object class and function is compared by mode.

Operating Expense by Object Class

Labor and fringe benefits are the two largest classes of operating expense. As indicated in **Exhibit 72**, these two classes total 75 percent of the total operating expenses for 1994, showing the labor-intensive nature of the transit industry and underscoring the industry's sensitivity to labor cost increases.

Exhibit 72

Distribution of Total Operating Expense by Object Class 1994



Materials and supplies incorporate fuel and lubricants, tires and tubes, and other miscellaneous materials and supplies. This object class consumed 9.3 percent of the total 1994 operating expenses.

Purchased transportation includes payments or accruals to providers operating transit service under contract to transit agencies, fare revenues the providers retain, and any other contract-related costs incurred by the purchasing transit agency, such as contract administration, customer information services, advertising, fuel, or vehicle maintenance. Purchased transportation absorbed 6.1 percent of operating expenses. This is exclusive of those transit agencies that have contractual relationships with providers filing a separate report. A discussion of purchased transportation in the NTD is provided in the Introduction of this publication.

The services object class includes professional and technical services, such as legal or audit fees, and contracted services, such as grounds maintenance or security. Services account for 4.8 percent of operating expense. Utilities represent 3.9 percent of the total operating expenses. These are costs associated with electricity (used to propel transit vehicles), as well as general building and station utilities. Other expenses comprise all remaining object classes, accounting for slightly over 1 percent combined.

Operating Expense by Mode and Object Class

The distribution of operating expense by mode and object class is displayed in **Exhibit 73**. Reconciling cash expenditures are not reported by mode. Direct labor and fringe benefits represent the largest classes of expense for all modes except demand response. With demand response, the significant role of purchased transportation is demonstrated by the 65.2 percent of demand response operating expense attributable to this object class. Because directly operated service is a much smaller portion of demand response operations, direct labor and fringe benefits account for much smaller portions of operating expense than with other modes. Direct labor and fringe benefits combined account for only 25.6 percent of demand response operating expenses.

Exhibit 73

Operating Expense by Mode and Object Class and Reconciling Cash Expenditures (Millions) 1994

Object Class	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	Total
Direct Labor	$4,324.9	$2,146.0	$919.9	$185.6	$116.3	$187.6	$7,880.3
Fringe Benefits	2,294.1	1,171.0	636.6	110.1	46.4	78.0	$4,336.1
Materials and Supplies	988.0	242.5	191.5	30.1	22.0	38.1	$1,512.2
Purchased Transportation	358.7	0.0	168.2	0.0	413.3	48.2	$988.4
Utilities	114.6	330.9	141.4	29.5	4.5	8.2	$629.1
Services	436.5	136.4	126.2	45.9	14.2	19.9	$779.2
Other	342.7	(240.6)	44.0	10.4	17.2	20.9	$194.7
Operating Expenses	$8,859.5	$3,786.2	$2,227.8	$411.6	$633.9	$401.0	$16,319.9
Reconciling Cash Expenditures							$961.4

Materials and supplies account for 11.2 percent of bus operating expense, significantly more than materials and supplies expense for the other modes. Fuel costs, tires, and other general vehicle maintenance items that bus service demands explain why bus accounted for 65.3 percent of materials and supplies expense for all modes combined.

Operating Expense by Function and Object Class

Operating expense by function and object class is presented in **Exhibit 74**. The exhibit shows how operating expense is spread over the various functions and how allocations to object classes vary by function. Reconciling cash expenditures are included. However, the expenditures are not allocated by function and object class. Some explanation is needed for this exhibit.

Exhibit 74

Operating Expense by Function and Object Class and Reconciling Cash Expenditures (Millions) 1994

Object Class	Vehicle Operation	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration	Total
Direct Labor	$4,417.5	$1,474.5	$996.9	$991.4	$7,880.3
Fringe Benefits	2,355.7	832.9	588.4	559.0	$4,336.1
Materials and Supplies	516.9	669.4	216.2	109.7	$1,512.3
Purchased Transportation	624.6	36.6	13.5	313.8	$988.4
Utilities	215.8	14.1	248.1	151.1	$629.1
Services	117.4	124.9	154.3	382.6	$779.2
Other	191.9	(14.8)	(387.8)	405.4	$194.7
Operating Expenses	$8,439.7	$3,137.6	$1,829.6	$2,913.0	$16,319.9
Reconciling Cash Expenditures					$961.4
Operating Expense for Directly Operated Service	$7,815.1	$3,101.1	$1,816.1	$2,599.3	$15,331.5

As noted in the Introduction, purchased transportation data not reported as directly operated include a subset of the data that constitutes the NTD. These data are reported under object class "purchased transportation in report" and coded as 508.1. While all expenses for directly operated service are allocated by object class and function, expenses for purchased transportation included in the buyer's report, or 508.1, include only the total cost for the buyer for the purchased services. This expense is not allocated by function. It is a lump sum that reflects the total cost for the buyer. The *1994 Reporting Manual* instructs agencies to report this lump expense under vehicle operations and/or general administration. The majority of agencies report these data under vehicle operations or general administration as the *1994 Reporting Manual* suggests, but a few agencies allocate "purchased transportation in report" expenses under vehicle maintenance and non-vehicle maintenance. Therefore, the resulting distribution of "purchased transportation in report" expenses across functions does not reflect the real weight of each function in the total expense. Thus, only the directly operated component of the total operating expense can provide an accurate picture of the relative weight of each function. The 1994 NTD cannot provide the real distribution of expenses across functions for the whole aggregated data. The reason for this limitation is related to the way purchased transportation is reported, as explained in the Introduction and in this chapter.

The allocation of operating expense by function and object class is displayed in **Exhibit 74**. The bottom line in the exhibit displays the total expense for each function for directly operated service which reflects the total expense for each function exclusive of object class "purchased transportation in report." Direct labor and fringe benefits represent a substantial amount of the expenses for vehicle operations and maintenance expenses. Over 86 percent of the total cost allocated to vehicle operations is expended with labor and fringe benefits, while the rates for vehicle maintenance and non-vehicle maintenance are 74.4 and 87.3 percent, respectively. The share of labor and fringe benefits for general administration is 60 percent, which is smaller than the rates for vehicle maintenance and non-vehicle maintenance, but still more than all other object classes together, demonstrating the sensitivity of the transit industry to labor-related issues.

General administration reflects much greater proportions of costs attributed to the services and "other" object classes than is found with the other functions. This is not unusual given that the level of services needed to support such administrative activities as legal services, finance and accounting, purchasing and stores, planning, marketing, and engineering is far greater than the level of services needed to support operations and maintenance functions.

Other expenses, such as casualty and liability costs, taxes, interest payments, depreciation, and leases and rentals, are also attributed to administrative activities. Thus, 30.3 percent of general administration expense is accounted for by services and other items; whereas these object classes account for very little of operations and maintenance expense.

Negative amounts appear in the "other" object classes for the maintenance functions due to expense transfers created by the adjustment and reclassification of previously recorded expenses to other functions. Also, expense transfers that resulted when non-operating costs temporarily credited to functions were ultimately capitalized are also incorporated into the other object class for purposes of this publication. The vehicle and non-vehicle maintenance functions are more capital-intensive and thus more likely to experience capitalization of non-operating costs resulting in expense transfers.

Operating Expense by Function and Mode for Directly Operated Service

Operating expenses by function and mode are displayed in **Exhibit 75**. The exhibit includes only the directly operated component of each modal expense. As explained, the object class purchased transportation in report (508.1) is not allocated by function and, therefore, must be excluded from the allocated expenses and reported only as a lump sum in the column total. The only modes not affected are heavy rail and light rail for not having a purchased transportation component in the service supplied. Bus and demand response are the only individual modes expending more than 50 percent of the total expenses with vehicle operations. The main reason for this is due to the high unit maintenance cost (vehicle and non-vehicle maintenance) of rail modes when contrasted with bus and demand response. While the share of maintenance for bus and demand response is 26 and 15.5 percent, respectively, the share for heavy rail, commuter rail, and light rail is 39.8, 43.7, and 41.7 percent, respectively. The share of vehicle operations for bus is 56.3 percent and for demand response is 60.3 percent. Demand response is the mode with the highest percentage of expenses, with general administration with 24.3 percent.

Exhibit 75

Operating Expense by Function and Mode and Reconciling Cash Expenditures (Millions) 1994

Mode	Vehicle Operation	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration	Total
Bus	$4,787.5	$1,848.6	$364.7	$1,500.1	$8,500.8
Heavy Rail	1,677.6	579.0	927.9	601.7	$3,786.2
Commuter Rail	831.7	495.6	405.3	327.0	$2,059.6
Light Rail	172.2	86.0	85.4	67.9	$411.6
Demand Response	133.0	30.6	3.6	53.5	$220.6
Other	213.1	61.3	29.3	49.0	$352.8
Total Directly Operated	$7,815.1	$3,101.0	$1,816.1	$2,599.3	$15,331.5
Purchased Transportation					$988.4
Grand Total					$16,319.9

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Chapter 6
Service Supplied and Consumed

Introduction

This chapter discusses general trends in service supplied and consumed, as well as measures of service effectiveness and efficiency based on specific performance indicators. Service supplied in the National Transit Database (NTD) includes variables such as vehicle revenue mile and hour, total vehicle miles and hours (revenue miles and hours plus deadhead mileage and time), and vehicles operated in maximum service.

Service consumed is measured by unlinked passenger trips and passenger miles. While service supplied is deterministic and under the control of transit agencies, variables of service consumed are non-deterministic and are determined by transit agencies through sampling. The Federal Transit Administration (FTA) requires that any sampling procedure meet a confidence level of 95 percent and a precision of 10 percent to be accepted for reporting to the NTD.

The most common measures of cost efficiency (the link between inputs, such as labor, capital, and fuel, and outputs, such as vehicle revenue miles and hours) are the ratios between operating expense and vehicle revenue mile or operating expense and vehicle revenue hour. The *National Transit Summaries and Trends (NTST)* presents measures of efficiency using the operating expenses per vehicle revenue mile ratio. However, other measures of efficiency can be easily obtained from the exhibits related to service supplied and operating expenses.

Cost effectiveness (the link between inputs — such as labor, capital, and fuel — and service consumption — such as unlinked passenger trips, passenger miles, operating revenue, and safety) is analyzed through evaluation of the operating expense per unlinked passenger trips and operating expenses per passenger mile ratios.

Service effectiveness (the link between service outputs — such as vehicle revenue miles and hours — and service consumption — such as unlinked passenger trips and passenger miles) is presented in this chapter by the ratio between unlinked passenger trips and vehicle revenue miles.

Directly Operated Service and Purchased Transportation

As explained in detail in the Introduction, the NTD has two categories of service: directly operated and purchased transportation. There are two ways of reporting purchased transportation data in the NTD. The first and most common way is the buyer filing its report and including the purchased transportation data. The purchased transportation data in this case include only a subset of the total required data for an agency directly operating its service and reporting to the NTD.

The second way of reporting purchased transportation is the seller filing its own report and directly operating its service. In most of these cases, the seller operates more than 100 vehicles in maximum service and must file a separate report. However, in some cases, the buyer of the service is a public entity that does not report to the NTD and the seller reports on behalf of the buyer. In other cases, both buyer and seller are reporters, with the seller operating less than 100 vehicles in maximum service and, therefore, not required to make a separate report submission. In this case, the reason for the seller reporting is that in some States, the law requires that all providers of public transportation report to be eligible to receive State funds.

The fact that a component of purchased transportation data is reported by the sellers implies that directly operated and purchased transportation are not mutually exclusive categories of service. All exhibits displaying data by type of service in this chapter include all the data for the directly operated category. Purchased transportation data displayed in these exhibits include only the aggregation of the component included in the buyer's report. A full accountability of purchased transportation data can be obtained by adding the total displayed in the exhibit under consideration with the corresponding data item displayed in **Exhibit 5** in the Introduction.

In many situations, it might be of interest to split the data between the public and private sectors, rather than split between directly operated and purchased transportation. The public sector would include all public agencies directly supplying the service consumed by the public. The private sector would include all private companies under contract to public agencies to provide public transportation. For the exhibits displaying data by type of service (directly operated and purchased transportation), the aggregation for public and private sectors can be achieved by adding the purchased transportation data item(s) included in **Exhibit 5** to the purchased transportation data item(s) included in the exhibit under analysis. This sum will result in the total data item(s) for the private sector. The same data item(s) included in **Exhibit 5** subtracted from the data item(s) for directly operated will result in the total data item(s) for the public sector. Refer to the Introduction for further information about limitations and restrictions on the characterization of public and private sectors in the NTD.

Chapter Organization

The chapter begins with discussions of service supplied and consumed by mode and type of service from 1990 through 1994. Performance measures are then presented to measure the effectiveness and efficiency of service supplied and consumed. Finally, indicators of service supplied and consumed as well as performance measures are provided based on urbanized area (UZA) size.

Vehicle Revenue Miles by Mode and Type of Service

Vehicle revenue miles by mode and type of service are presented in **Exhibit 76**. Transit service supplied amassed nearly 2.7 billion vehicle revenue miles in 1994. Bus is the mode with the highest percentage of vehicle revenue miles with 59 percent, followed by heavy rail with 19.2 percent and demand response with 10.2 percent.

Exhibit 76

Vehicle Revenue Miles by Mode and Type of Service
(Millions)
1994

Mode	Directly Operated	Purchased Transportation*	Total
Bus	1,474.1	111.8	1,585.8
Heavy Rail	516.0	0.0	516.0
Commuter Rail	191.0	18.5	209.5
Light Rail	33.3	0.0	33.3
Demand Response	80.6	192.2	272.8
Other	33.7	28.4	62.1
Total	2,328.6	350.9	2,679.5

* Purchased transportation data are partial because directly operated includes some purchased transportation data. Refer to Exhibit 5 in the Introduction.

All modes provide part of the service supplied through purchased transportation contracts with private providers with the exception of heavy rail and light rail, which are owned and operated exclusively by the public sector. The percentage of vehicle revenue miles provided by the private sector was 17.6 percent in 1994. These data are obtained by adding the total purchased transportation displayed in this exhibit and the total purchased transportation directly operated given in **Exhibit 5**. Bus accounted for 43.2 percent of all purchased transportation service supplied in 1994 and demand response 43.3 percent. Demand response is the only mode in which participation by the private sector is greater than the public sector's participation in the supply of transit service. Bus and demand response together accounted for 86.5 percent of all purchased transportation service supplied as measured by vehicle revenue miles. All percentages related to purchased transportation include the data displayed in **Exhibit 5**.

Vehicle revenue miles by mode for the 1990-1994 timeframe are displayed in **Exhibit 77**. Demand response and light rail are the modes with the largest increases in service supplied for the 1990-1994 timeframe. Annual vehicle revenue miles for demand response rose 59.3 percent between 1990 and 1994. Light rail service increased 45.2 percent during the same timeframe. Commuter rail and bus experienced less substantial growth, with 8.6 percent and 3.3 percent, respectively. Heavy rail is the only mode to show a loss during this time period with a decline of 0.9 percent.

Exhibit 77

Vehicle Revenue Miles by Mode
(Millions)
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	1,534.5	1,552.4	1,555.9	1,578.3	1,585.8
Heavy Rail	520.8	508.3	509.7	505.2	516.0
Commuter Rail	193.0	197.9	199.9	203.4	209.5
Light Rail	22.9	26.6	27.8	26.9	33.3
Demand Response	171.2	185.8	208.5	243.4	272.8
Other	24.2	27.8	32.2	35.9	62.1
Total	2,466.6	2,498.8	2,534.0	2,593.1	2,679.5

Vehicle Revenue Hours by Mode and Type of Service

Vehicle revenue hours by mode and type of service are shown in **Exhibit 78**. Bus is the mode with the highest percentage of vehicle revenue hours, followed by heavy rail and demand response. The rates are 68.2, 13.8, and 10.9 percent for bus, heavy rail, and demand response, respectively. The percentage of vehicle revenue hours provided by the private sector was 13 percent in 1994. This percentage is obtained by adding the total purchased transportation displayed in this exhibit and the total purchased transportation directly operated displayed in **Exhibit 5**.

Exhibit 78

Vehicle Revenue Hours by Mode and Type of Service
(Millions)
1994

Mode	Directly Operated	Purchased Transportation*	Total
Bus	116.2	6.9	123.0
Heavy Rail	25.0	0.0	25.0
Commuter Rail	5.7	0.5	6.2
Light Rail	2.3	0.0	2.3
Demand Response	6.0	13.6	19.6
Other	2.6	1.6	4.2
Total	157.8	22.6	180.3

* Purchased transportation data are partial because directly operated includes some purchased transportation data. Refer to Exhibit 5 in the Introduction.

The change in vehicle revenue hours over the 1990-1994 timeframe is given in **Exhibit 79**. As with miles of service, the largest increase occurred in demand response at 59.6 percent, which has grown steadily each year. Light rail and bus also increased by 21 percent and 2.4 percent, respectively. Commuter rail experienced a small increase of 1.6 percent compared with 1990. Similarly, heavy rail vehicle revenue hours show a decline of 5 percent compared with 1990 figures. Since 1991, heavy rail hours have increased annually at a steady rate.

Exhibit 79

Vehicle Revenue Hours by Mode
(Millions)
1990-1994

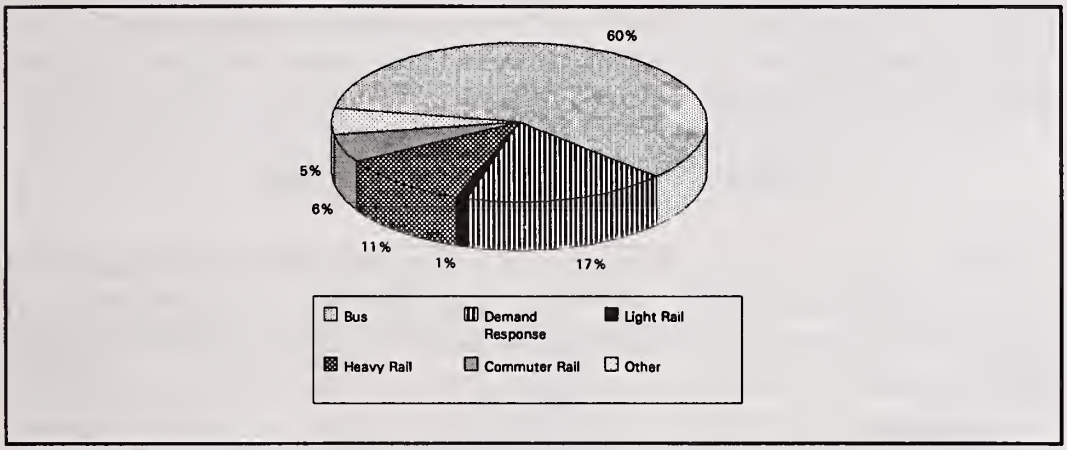
Mode	1990	1991	1992	1993	1994
Bus	120.1	120.9	122.0	122.7	123.0
Heavy Rail	26.3	21.7	23.3	24.7	25.0
Commuter Rail	6.1	5.9	5.8	6.0	6.2
Light Rail	1.9	2.1	2.1	1.9	2.3
Demand Response	12.3	13.4	14.9	16.9	19.6
Other	2.3	2.5	2.6	2.7	4.2
Total	169.0	166.5	170.7	174.9	180.3

Vehicles Operated in Maximum Service by Mode

Another measure of service supplied is the number of vehicles operated in maximum service. As can be seen in **Exhibit 80**, bus is the dominant mode. Bus provided the largest number of vehicles operated in maximum service, with 59.36 percent. For the other modes, the next largest number of vehicles operated was demand response service, with 17.4 percent, followed by heavy rail service, with 11.2 percent.

Exhibit 80

Distribution of Vehicles Operated in Maximum Service by Mode 1994



The variations in the number of vehicles operated in maximum service over the 1990-1994 timeframe can be seen in **Exhibit 81**. Similar to the pattern found for vehicle revenue miles and hours given in previous exhibits, demand response and light rail are the modes with the largest increases in the number of vehicles operated in maximum service between 1990 and 1994. Demand response displayed an increase of 62.3 percent for this timeframe, while light rail displayed an increase of 15.6 percent. Other modes displayed modest increases. Light rail and demand response are the only modes with increases greater than the overall increase of 13 percent observed in the 1990-1994 timeframe. The large increase in the number of vehicles operated in maximum service for demand response is explained, in part, by its low capacity nature and a growing demand for this mode. The increase for light rail is explained by the expansion in the number of providers across the nation during the 1990-1994 timeframe. It should be noted, however, that the number of vehicles operated in maximum service for light rail decreased 0.5 percent in 1994 compared with 1993. This decrease was due to a reduction in the number of light rail routes operated by the Southeastern Pennsylvania Transportation Authority, Philadelphia.

Exhibit 81

Vehicles Operated in Maximum Service by Mode 1990-1994

Mode	1990	1991	1992	1993	1994
Bus	42,869	42,959	43,861	44,041	43,723
Heavy Rail	8,347	8,106	8,180	8,187	8,277
Commuter Rail	4,163	3,989	3,949	4,214	4,349
Light Rail	665	811	798	773	769
Demand Response	7,903	8,435	9,274	11,262	12,828
Other	1,195	1,524	1,633	1,830	3,702
Total	65,142	65,824	67,695	70,307	73,648

Service Supplied: Modal Comparison

Exhibit 82 compares the modal shares of each of the service supplied measures examined in this chapter. Evident is the dominance of bus service, accounting for 59.2, 68.2, and 59.3 percent of vehicle revenue miles, revenue hours, and number of vehicles operated in maximum service, respectively. Bus and demand response have a larger share of vehicle revenue hours when compared with vehicle revenue miles. Also, the data indicate that bus is not as fast as demand response. Bus systems operate on fixed routes with fixed stops and incur dwell time in traffic. Both represent important components of the travelling time for bus. Service supplied data for demand response reveal the low capacity nature of this mode when contrasted with bus and rail modes. Demand response shares 17.4 percent of total vehicles operated in maximum service, but its share of vehicle revenue miles and hours is slightly more than 10 percent.

Exhibit 82

Modal Comparison of Service Supplied
1994

Mode	Percentage of Vehicle Revenue Miles	Percentage of Vehicle Revenue Hours	Percentage of Vehicles in Maximum Service
Bus	59.2%	68.2%	59.4%
Heavy Rail	19.3	13.9	11.3
Commuter Rail	7.8	3.4	5.4
Light Rail	1.2	1.3	1.0
Demand Response	10.2	10.9	17.4
Other	2.3	2.3	5.0
Total	100%	100%	100%

Among rail modes, heavy rail, and commuter rail are fixed guideway modes that usually do not share the right-of-way with other modes or general traffic. Therefore, their shares of vehicle revenue miles are greater than their shares of vehicle revenue hours. Light rail is the mode with the smallest share of vehicle revenue miles, vehicle revenue hours, and vehicles operated in maximum service. Many light rail systems do not operate in exclusive rights-of-way and this affects their average speed.

Service Consumed: Unlinked Passenger Trips by Mode

Over 7.7 billion passenger trips were reported in 1994. As shown in **Exhibit 83**, bus carried 60.1 percent of the total ridership in 1994, followed by heavy rail, with 28.2 percent. All the other modes combined share the remaining 11.7 percent.

Directly operated service accounted for 96.6 percent of service consumed, as measured by unlinked passenger trips. It includes both public agencies directly operating their services and part of the private providers under contract to public agencies. When the data for private providers directly operating their services are added to the purchased transportation reported by the buyers, the share of the private sector in terms of unlinked passenger trips is 6.9 percent of the total ridership. In addition, bus is the mode with the largest share of the total service consumed made available by the private sector, with 72.5 percent of the unlinked passenger trips.

Unlinked Passenger Trips by Mode and Type of Service
(Millions)
1994

Exhibit 83

Mode	Directly Operated	Purchased Transportation*	Total
Bus	4,478	151	4,629
Heavy Rail	2,169	0	2,169
Commuter Rail	318	21	339
Light Rail	282	0	282
Demand Response	17	37	54
Other	178	50	228
Total	7,442	259	7,702

* Purchased transportation data are partial because directly operated includes some purchased transportation data. Refer to Exhibit 5 in the Introduction.

The changes in unlinked passenger trips over the past 5 years are provided in **Exhibit 84**. Overall, ridership decreased 3.3 percent from 1990 to 1994. However, unlinked passenger trips in 1994 are 3.6 percent greater. Ridership for bus had a small decline in 1994 compared with 1993 and is still 5.3 percent less than 1990. Heavy rail displayed a different behavior. The ridership for this mode increased in 1994 by 6 percent and is 7.5 percent smaller than 1990. The increase of 6 percent in the ridership of heavy rail in 1994 is significant, taking into account the reporting change by the Massachusetts Bay Transportation Authority (Boston), which previously reported some light rail lines as heavy rail. In 1994, these lines were reported as light rail. Commuter rail reversed a trend of decrease observed between 1990 and 1992, and unlinked passenger trips for this mode increased from 1992 to 1994 by 7.9 percent. Light rail experienced a substantial increase in ridership, mostly as a result of the reporting change by Boston previously mentioned, but also as a result of the implementation of new systems in St. Louis and Denver. Demand response had its ridership increased by 35.2 percent for the 1990-1994 timeframe. In 1994, unlinked passenger trips were 4 percent greater than in 1993.

Unlinked Passenger Trips by Mode
(Millions)
1990-1994

Exhibit 84

Mode	1990	1991	1992	1993	1994
Bus	4,887	4,826	4,748	4,638	4,629
Heavy Rail	2,346	2,167	2,207	2,046	2,169
Commuter Rail	328	324	314	321	339
Light Rail	174	184	187	188	282
Demand Response	40	42	45	52	54
Other	190	192	194	188	228
Total	7,965	7,735	7,695	7,433	7,702

Passenger Miles by Mode

Another measure of service consumption, passenger mile, is a variable reported by agencies in the NTD. Passenger miles are available by mode and type of service and are usually determined through sampling.

As shown in **Exhibit 85**, more than 37.8 billion passenger miles were reported in 1994. Ninety-five percent of all these miles were reported in directly operated service. The directly operated service includes both public agencies directly operating their services and some of the private providers under contract to public agencies. When the data for the private providers directly operating their services are added to the purchased transportation reported by the buyers, the share of the private sector in terms of passenger miles is 11.6 percent of the total passenger miles.

Exhibit 85

Passenger Miles by Mode and Type of Service
(Millions)
1994

Mode	Directly Operated	Purchased Transportation*	Total
Bus	16,195	1,000	17,195
Heavy Rail	10,668	-	10,668
Commuter Rail	7,366	630	7,996
Light Rail	831	-	831
Demand Response	131	245	377
Other	567	248	815
Total	35,758	2,123	37,882

* Purchased transportation data are partial because directly operated includes some purchased transportation data. Refer to Exhibit 5 in the Introduction.

The dominance of bus is again evident when examining passenger miles by mode. Bus accounts for 45.4 percent of all passenger miles, followed by 28.2 percent for heavy rail and 21.1 percent for commuter rail. Light rail and demand response each account for 2.2 percent and 1 percent, respectively, of the total.

As seen in **Exhibit 86**, passenger miles decreased slightly (0.29 percent) in the 1990-1994 timeframe. Bus and heavy rail experienced decreases in passenger miles between 1990 and 1994. These two modes together accounted for 73.5 percent of all passenger

Exhibit 86

Passenger Miles by Mode
(Millions)
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	18,070	18,104	17,494	17,364	17,195
Heavy Rail	11,475	10,488	10,737	10,231	10,668
Commuter Rail	7,083	7,383	7,320	6,912	7,996
Light Rail	570	661	700	704	831
Demand Response	259	274	317	389	377
Other	535	563	585	625	815
Total	37,992	37,473	37,153	36,225	37,882

miles in 1994. Light rail and demand response are the modes with the largest increases in passenger miles for the 1990-1994 timeframe (45.0 and 45.4 percent respectively) following the trend observed for unlinked passenger trips for these two modes.

Passenger miles increased by 4.6 percent in 1994 compared with 1993 and only demand response and bus experienced decreases in relation to 1993. The modes with the highest increases in 1994 were light rail with 18 percent and commuter rail with 15.7 percent compared with 1993.

Service Consumed: Modal Comparison

The distribution of unlinked passenger trips and passenger miles by mode is given in **Exhibit 87** as well as the average trip length for each mode. Bus is the mode with the biggest share of service consumed with 60.1 percent of all unlinked passenger trips and 45.4 percent of all passenger miles in 1994. Heavy rail displays a similar share of unlinked passenger trips and passenger miles and is the mode with the second largest share of service consumed. Commuter rail's share of passenger miles is much higher than its share of unlinked passenger trips; this is a result of the long trip length of this mode. Light rail and demand response account for a small share of service consumed, both in terms of ridership and passenger miles. The average trip length for all modes combined is 4.9 miles.

Exhibit 87

Distribution of Unlinked Passenger Trips and Passenger Miles With Average Trip Length by Mode 1994

Mode	Percentage of Total Unlinked Passenger Trips	Percentage of Total Passenger Miles	Average Trip Length in Miles
Bus	60.1%	45.4%	3.7
Heavy Rail	28.2	28.2	4.9
Commuter Rail	4.4	21.1	23.6
Light Rail	3.7	2.2	2.9
Demand Response	0.7	0.9	7.0
Other	2.9	2.2	3.6
Total	100.0%	100.0%	
Weighted Average			4.9

Performance Indicators

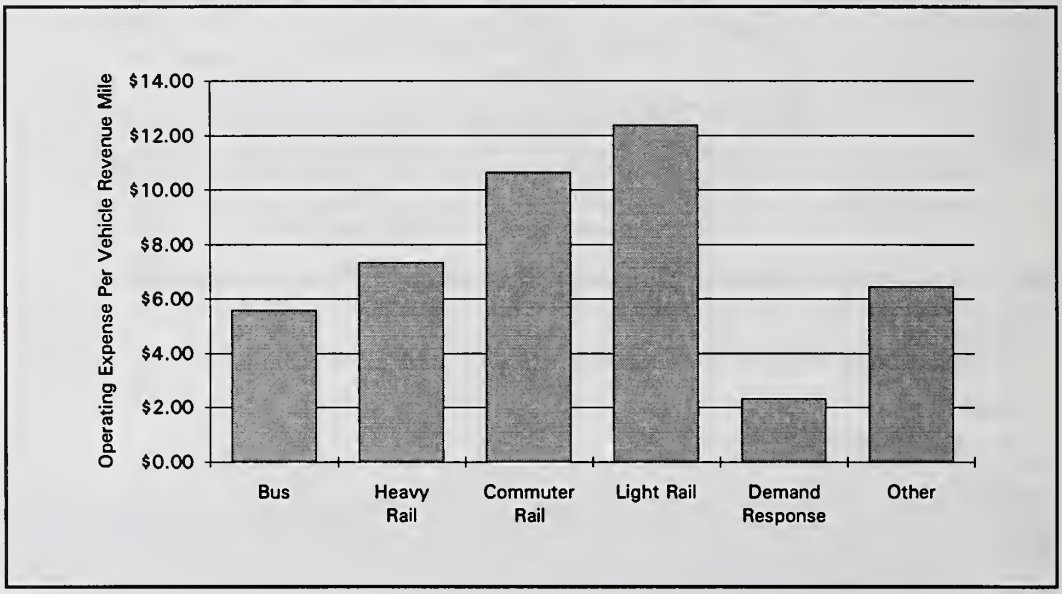
Certain performance indicators are used to assess the effectiveness and efficiency of transit service delivery. Operating expense per vehicle revenue mile is one measure of service efficiency, while operating expense per unlinked passenger trip and operating expense per passenger mile offer measures of cost effectiveness. Service effectiveness is analyzed by examining the ratio between unlinked passenger trips and vehicle revenue miles.

Service Efficiency: Operating Expense Per Vehicle Revenue Mile by Mode

Service efficiency as measured by operating expense per vehicle revenue mile is displayed in **Exhibit 88**. Demand response has the smallest cost per mile, at $2.32 per vehicle revenue mile, followed by bus, at $5.59 per vehicle revenue mile. The rail modes displayed higher operating expense per revenue mile than bus and demand response. In addition, hourly wages for rail modes are usually higher than the hourly wages for bus and demand response, and rail modes have less revenue mile per total employee hours than bus and demand response. Further, a substantial component of the cost per mile of rail modes is related to maintenance costs (both vehicle and non-vehicle maintenance), while this component is not as significant for bus and demand response. Comparing bus to demand response, the average hourly wage for bus is substantially higher (65 percent higher) than the average hourly wage for demand response. For these two modes, labor is the dominant factor in the cost of public transportation service. Another factor, although not as relevant as hourly wage, is the effect of purchased transportation in the cost per mile of demand response. Private providers generate more than 50 percent of all service supplied for demand response. These providers are usually more efficient in the production of service supplied due to the lower hourly wages and more restrictive fringe benefits offered to their employees.

Exhibit 88

Operating Expense Per Vehicle Revenue Mile by Mode
1994



Among rail modes, light rail and commuter rail have higher cost per mile than heavy rail. Commuter rail's high peak-to-base ratio is an important factor for its higher cost per mile. In addition, commuter rail is the mode with the highest hourly wage per vehicle hour among all modes. Comparing heavy rail to light rail, the number of revenue miles per total employee hours is substantially higher for heavy rail. Heavy rail operates in dense corridors and is designed to operate with small headways in exclusive rights-of-ways at high speeds. Therefore, heavy rail produces more output (both revenue miles and hours) per total hour

of operation than light rail. This implies a lower cost per mile for heavy rail despite the fact that the average wage for heavy rail is higher than the average wage for light rail.

The changes in operating expenses per vehicle revenue mile by mode from 1990 to 1994 is displayed in **Exhibit 89.** The cost per mile increased for all modes except for heavy rail and commuter rail during this period. The largest increase occurred in bus, with 10 percent, and light rail, with 20.4 percent. Demand response followed with a moderate 3.1 percent increase. Heavy rail remained relatively consistent. Commuter rail declined by 4.8 percent. Compared with 1993, all modes experienced increases in cost per mile.

Operating Expense Per Vehicle Revenue Mile by Mode
1990-1994

Exhibit 89

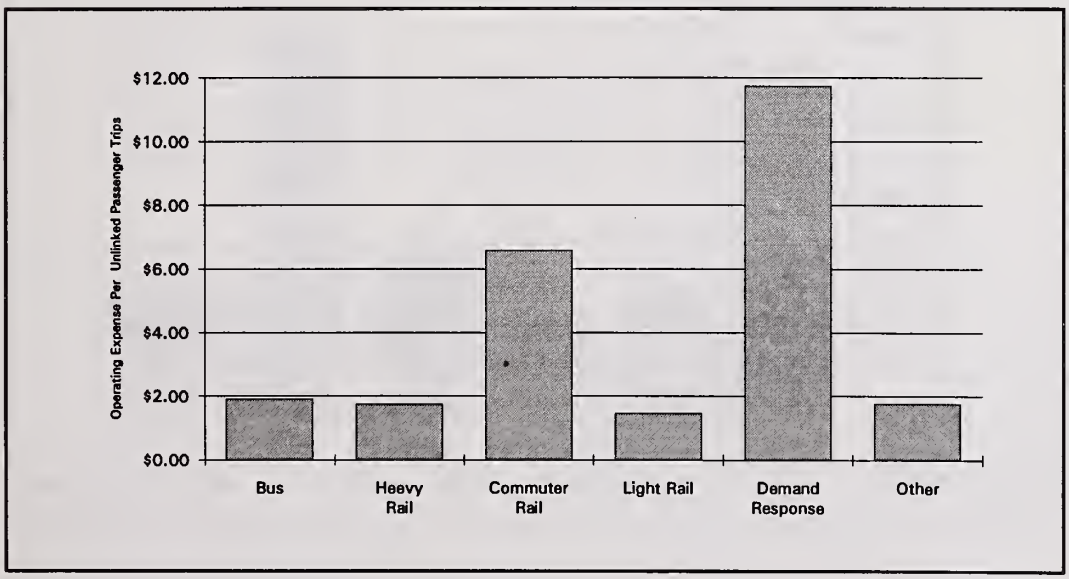
Mode	1990	1991	1992	1993	1994
Bus	$5.07	$5.37	$5.54	$5.39	$5.59
Heavy Rail	7.34	7.56	6.97	7.26	7.34
Commuter Rail	11.17	10.99	10.85	10.22	10.63
Light Rail	10.26	10.89	11.05	11.66	12.38
Demand Response	2.25	2.38	2.40	2.22	2.32

Cost Effectiveness: Operating Expense Per Unlinked Passenger Trip by Mode

The cost effectiveness of each mode as measured by operating expenses per unlinked passenger trips is displayed in **Exhibit 90**. Light rail, heavy rail, and bus are the most cost effective modes with their costs per trip ranging from $1.46 to $1.91. Commuter rail and demand response costs, however, are much less effective. For not being a mass transit mode, demand response has a higher cost per unlinked passenger trips than any other mode. Commuter rail has poor cost effectiveness, as measured by operating expense per unlinked passenger trip, but has much better effectiveness if the measure is operating expense per passenger mile.

Operating Expense Per Unlinked Passenger Trip by Mode
1994

Exhibit 90



The changes in operating expense per unlinked passenger trip by mode from 1990 to 1994 are displayed in **Exhibit 91**. Although bus, heavy rail, and light rail remain cost effective modes, their costs per trip have increased 7.3 to 22.4 percent since 1990. Commuter rail cost, though significantly higher, has also increased about 12 percent. Demand response experienced the most dramatic change in the cost per trip, with an increase of 37 percent. Demand response is the mode where growth in ridership always adversely affects its cost effectiveness. The decrease in the cost per unlinked passenger trip observed from 1992 to 1993 for demand response is the result of an overstated aggregation of operating expenses for that year.

Exhibit 91

Operating Expense Per Unlinked Passenger Trip by Mode
1990-1994

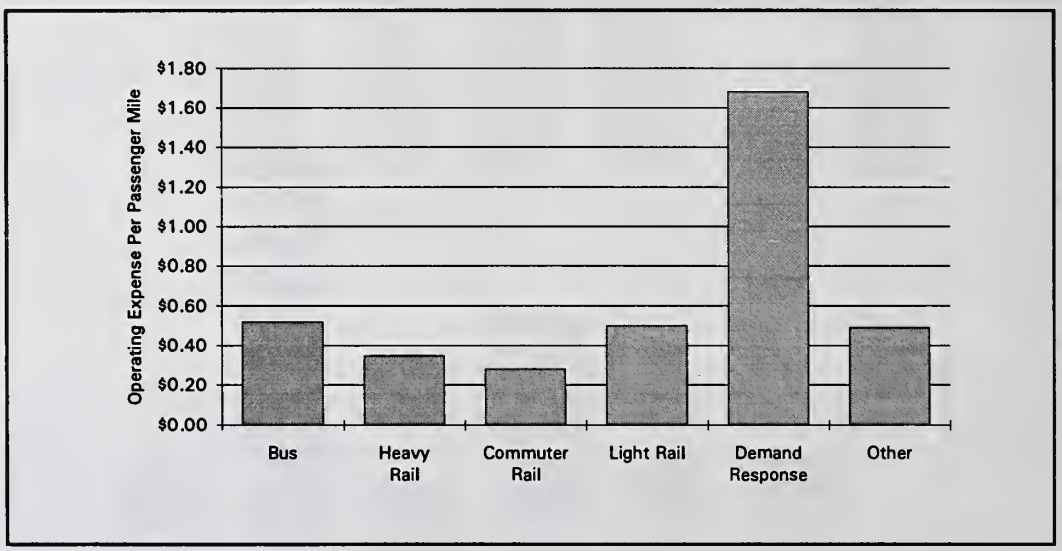
Mode	1990	1991	1992	1993	1994
Bus	$1.56	$1.65	$1.82	$1.84	$1.91
Heavy Rail	1.63	1.77	1.61	1.79	1.75
Commuter Rail	5.87	6.01	6.92	6.48	6.57
Light Rail	1.36	1.58	1.64	1.68	1.46
Demand Response	8.53	9.47	11.03	10.38	11.73

Operating Expense Per Passenger Mile by Mode

Another assessment of cost effectiveness is provided through a comparison of operating expense per passenger mile by mode in **Exhibit 92**. Commuter rail and heavy rail are the most cost effective modes when cost per passenger mile is examined. This is due to their greater vehicle capacity, higher ridership, and longer trips taken on these modes. Conversely, demand response has the highest cost per passenger mile due to its long trip length but low vehicle capacity.

Exhibit 92

Operating Expense Per Passenger Mile by Mode
1994



The change in operating cost per passenger mile by mode from 1990 to 1994 can be seen in **Exhibit 93**. All modes experienced increases in cost per mile during this period. The largest increases occurred in demand response, with 27.3 percent, and bus, with 23.8 percent. Light rail and heavy rail followed with increases of 19.5 percent and 6.1 percent, respectively. Again, changes from 1992 to 1993 reflect enhanced accounting for purchased transportation expenses.

Exhibit 93

Operating Expense Per Passenger Mile by Mode
1990-1994

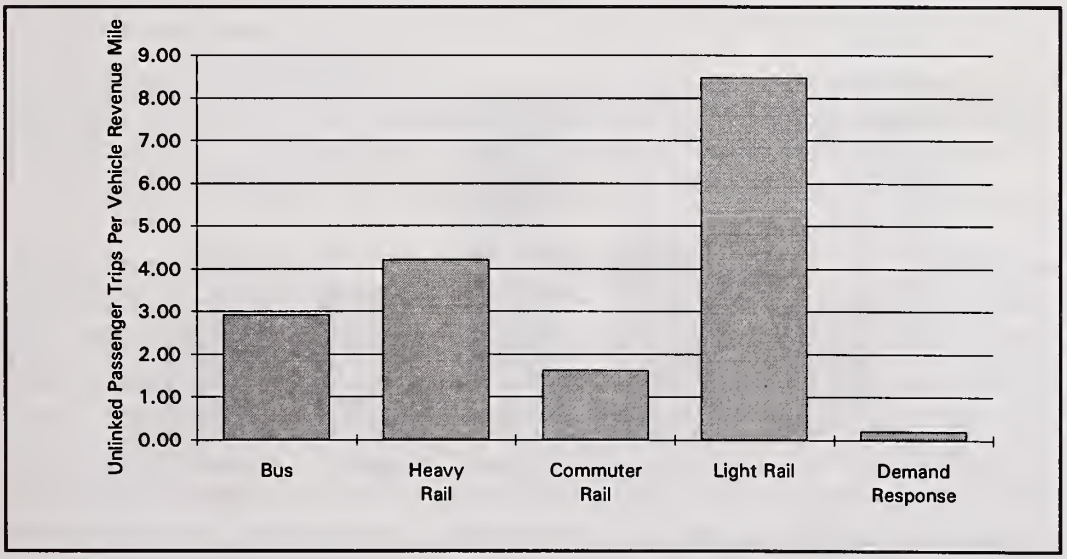
Mode	1990	1991	1992	1993	1994
Bus	$0.42	$0.44	$0.49	$0.49	$0.52
Heavy Rail	0.33	0.37	0.33	0.36	0.35
Commuter Rail	0.27	0.26	0.30	0.30	0.28
Light Rail	0.41	0.44	0.44	0.45	0.50
Demand Response	1.32	1.48	1.58	1.39	1.68

Service Effectiveness: Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode

The service effectiveness of each mode is measured by comparing service used to service supplied. In this chapter, it is measured by the ratio of unlinked passenger trips to vehicle revenue miles. As **Exhibit 94** shows, light rail is the mode with the best service effectiveness followed by heavy rail. Light rail and heavy rail are located in large urbanized areas serving dense corridors and are designed as high capacity modes. Commuter rail is also located in dense urbanized areas and is a high capacity mode but has longer trip lengths due to its commuter orientation and ridership concentrated during peak periods. Therefore, commuter rail has poor service effectiveness compared with heavy rail and light rail. Bus serves all sizes of urbanized areas and its service effectiveness has a large variance. Demand response has the worst service effectiveness due to its low capacity.

Exhibit 94

Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode
1994



The change in unlinked passenger trips per vehicle revenue mile by mode from 1990 to 1994 is displayed in **Exhibit 95**. All modes experienced decreases during this period with the exception of light rail. Demand response shows the largest decrease with 13.8 percent. Bus, heavy rail, and commuter rail displayed decreases of 8.2, 6.8, and 4.8 percent, respectively, for the 1990-1994 timeframe. Light rail shows an increase in service effectiveness of 11.6 percent for that period.

Exhibit 95

Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode
1990-1994

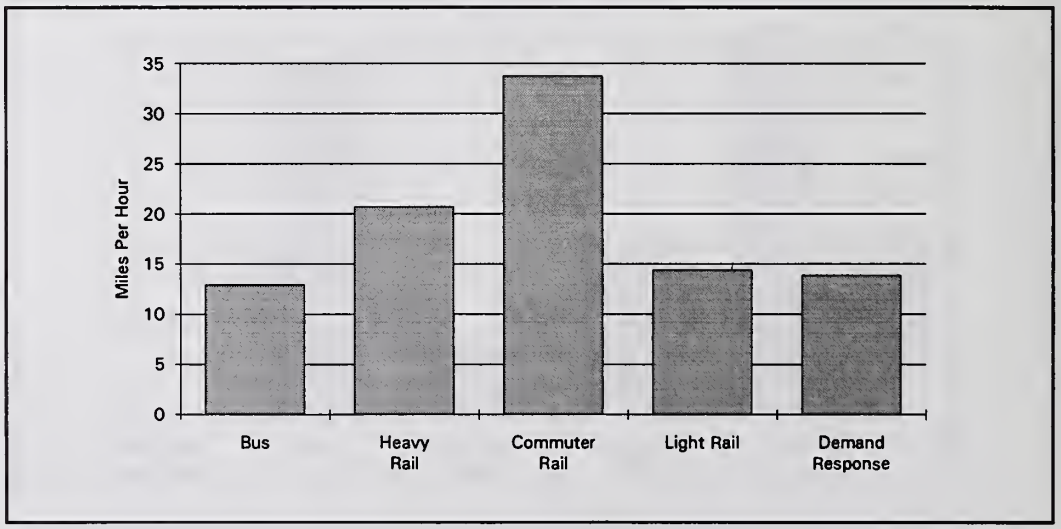
Mode	1990	1991	1992	1993	1994
Bus	3.18	3.11	3.05	2.94	2.92
Heavy Rail	4.51	4.26	4.33	4.05	4.20
Commuter Rail	1.70	1.64	1.57	1.58	1.62
Light Rail	7.60	6.90	6.74	6.96	8.48
Demand Response	0.23	0.23	0.22	0.21	0.20

Average Operating Speed

Average operating speed varies greatly among the modes. As **Exhibit 96** shows, bus, light rail, and demand response services operate at a much slower speed than heavy rail or commuter rail. Bus service operates in mixed traffic with frequent stops for boarding and alighting. Many light rail systems must also contend with mixed traffic while operating at-grade. The station/stop spacing of light rail also requires more frequent stopping for passenger boarding and alighting compared with the other rail modes. Demand response service also operates in mixed traffic and must deal with significantly longer boarding and alighting times for physically challenged patrons. Heavy rail and commuter rail operate along exclusive fixed guideways, with heavy rail stopping more frequently due to a shorter station spacing than commuter rail.

Exhibit 96

Average Operating Speed by Mode
1994



A comparison of operating speeds of directly operated and purchased transportation services is displayed in **Exhibit 97**. Across all modes, purchased transportation services are operated at higher speeds. Purchased bus service operates at an average speed nearly 28 percent higher than directly operated bus services. This may be as the result of transit agencies contracting out suburban flyer and express services. The difference between the two types of service is smaller for commuter rail, with an average speed 23.6 percent higher for purchased service. The difference is less significant for demand response, where purchased services operated only 5.2 percent faster than directly operated service.

Exhibit 97

Operating Speed by Mode and Type of Service
1994

Mode/Type of Service	Speed
Bus	
Directly Operated	12.7
Purchased Transportation*	16.2
Modal Average	12.9
Heavy Rail	
Directly Operated	20.7
Purchased Transportation*	0.0
Modal Average	20.7
Commuter Rail	
Directly Operated	33.3
Purchased Transportation*	41.1
Modal Average	33.8
Light Rail	
Directly Operated	14.4
Purchased Transportation*	0.0
Modal Average	14.4
Demand Response	
Directly Operated	13.4
Purchased Transportation*	14.1
Modal Average	13.9

* Purchased transportation data are partial because directly operated includes some purchased transportation data. Refer to Exhibit 5 in the Introduction.

Vehicle Revenue Miles by UZA Size and Mode

Vehicle revenue miles by UZA size and mode can be seen in **Exhibit 98**. It displays the significant share of vehicle revenue miles provided within UZAs with populations greater than 1 million. In total, 79.2 percent of all vehicle revenue miles were operated in these larger areas, followed by 14.1 and 6.7 percent in medium and small UZAs, respectively. The amount and mode of service varies by UZA size. Most obvious are the rail services, which operated almost exclusively in the large areas. The three rail modes combined account for almost 36 percent of all revenue miles in large UZAs. Bus accounts for more than 54 percent of vehicle revenue miles in these areas, followed by demand response,

with 7.4 percent. Service within the mid-size urbanized areas is also dominated by bus, with 79.1 percent. Demand response service, however, accounts for a larger portion of service with a 18.4 percent share. The demand response share is the largest in small UZAs, where it provides 26.1 percent of all service operated.

Exhibit 98

Vehicle Revenue Miles by UZA Size and Mode
(Millions)
1994

UZA Size	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	129.6	-	-	0.1	46.9	3.2	179.8
200,000 to 1 Million	297.1	-	0.5	1.0	69.2	7.8	375.5
Over 1 Million	1,159.1	516.0	209.1	32.2	156.7	51.2	2,124.3
Total	1,585.8	516.0	209.5	33.3	272.8	62.1	2,679.5

Vehicles Operated in Maximum Service by UZA Size and Mode

The number of vehicles operated in maximum service by UZA size and mode is displayed in **Exhibit 99**. The patterns evident in vehicle revenue miles are also provided with the number of vehicles. First, heavy rail, commuter rail, and light rail are operated almost exclusively in the largest UZAs. Combined, these modes account for 23.8 percent of the total vehicles operated during maximum service. Second, bus is the dominant mode in all UZAs, regardless of size. Finally, the share of demand response vehicles has an inverse relationship to urbanized area size. The greatest share of 40.2 percent occurs in the small UZAs, decreases to 25 percent in the medium areas, and, again, to 13.3 percent in the large areas.

Exhibit 99

Vehicles Operated in Maximum Service by UZA Size and Mode
(Millions)
1994

UZA Size	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	3,538	-	-	4	2,534	232	6,308
200,000 to 1 Million	8,060	-	13	28	2,840	429	11,370
Over 1 Million	32,125	8,277	4,336	737	7,454	3,041	55,970
Total	43,723	8,277	4,349	769	12,828	3,702	73,648

Unlinked Passenger Trips by UZA Size and Mode

The unlinked passenger trips by UZA size and mode can be seen in **Exhibit 100**. It displays the change in transit ridership from 1990 to 1994 by UZA size and mode. Overall, there was a ridership growth in small and mid-size UZAs at 7.2 and 2.4 percent, respectively. For the 1990-1994 timeframe, ridership for large UZAs decreased by 4.2 percent, but ridership in 1994 is 4.1 percent higher than in 1993. As shown in this exhibit, transit ridership is concentrated in the large UZAs. In total, nearly 88 percent of all transit trips occurred in these areas. The mid-size areas followed with nearly 9 percent, and the small areas accounted for only 3 percent of the total transit ridership during this period.

Exhibit 100

Unlinked Passenger Trips by UZA Size and Mode
(Millions)
1990-1994

UZA Size	Year	Mode						Total
		Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	1990	211	-	-	0	8	2	221
	1991	217	-	-	0	9	2	228
	1992	223	-	-	0	10	2	235
	1993	221	-	-	0	12	2	235
	1994	223	-	-	0	12	2	237
200,000 to 1 Million	1990	647	-	0	8	10	5	670
	1991	657	-	0	8	10	4	679
	1992	666	-	0	9	11	4	690
	1993	661	-	0	8	12	5	686
	1994	658	-	0	9	13	5	686
Over 1 Million	1990	4,029	2,346	328	166	22	184	7,075
	1991	3,951	2,167	324	175	23	187	6,827
	1992	3,859	2,207	313	179	25	188	6,771
	1993	3,757	2,046	320	179	28	182	6,512
	1994	3,748	2,169	339	273	29	220	6,779
Total	1990	4,887	2,346	328	174	40	191	7,966
	1991	4,825	2,167	324	183	42	193	7,734
	1992	4,748	2,207	314	187	45	194	7,695
	1993	4,638	2,046	321	188	52	188	7,433
	1994	4,629	2,169	339	282	54	228	7,702

Among the various modes, demand response experienced a ridership growth in all UZAs, with 39 percent in small and mid-size areas and 31.8 percent in the large UZAs. Bus had increased ridership in small and mid-size areas by 2.7 percent and experienced a loss of 7 percent in the large UZAs. Light rail also experienced ridership growth in all areas, with an increase of 12.5 percent in mid-size UZAs and 64 percent in large UZAs. It should be noted that the increase for light rail is, in part, due to a reporting change by Boston that reported in 1994 some light rail lines that were reported as heavy rail in previous years. Commuter rail ridership increased 3.3 percent in large UZAs. Heavy rail, the only mode to operate solely in the large UZAs, posted a ridership loss of 7.5 percent during this period. However, the ridership for heavy rail increased by 6 percent in 1994 compared with 1993, despite the "loss" of some lines to light rail as a result of the reporting change by Boston.

Passenger Miles by UZA Size and Mode

The change in passenger miles by UZA size and mode between 1990 and 1994 is provided in **Exhibit 101**. Overall, there was an 18.8 percent increase in passenger miles in small UZAs between 1990 and 1994. Passenger miles in mid-size UZAs increased 4.5 percent, while passenger miles in large UZAs decreased 1.1 percent between 1990 and 1994. However, passenger miles increased in all UZAs from 1993 to 1994. The increase for small and mid-size UZAs was 4.3 and 2.1 percent, respectively. Large UZAs experienced the highest increase at 4.8 percent.

Exhibit 101

Passenger Miles by UZA Size and Mode
(Millions)
1990-1994

UZA Size	Year	Mode						Total
		Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	1990	748	-	-	0	47	7	802
	1991	780	-	-	0	53	13	846
	1992	815	-	-	0	63	10	888
	1993	810	-	-	0	77	27	914
	1994	843	-	-	0	77	33	953
200,000 to 1 Million	1990	2,535	-	-	20	74	29	2,658
	1991	2,553	-	0	20	73	38	2,684
	1992	2,552	-	5	19	91	46	2,713
	1993	2,540	-	6	19	104	52	2,721
	1994	2,593	-	6	19	96	65	2,779
Over 1 Million	1990	14,786	11,475	7,082	549	137	499	34,528
	1991	14,771	10,488	7,379	642	147	512	33,939
	1992	14,127	10,737	7,315	681	162	529	33,551
	1993	14,014	10,231	6,906	684	209	546	32,590
	1994	13,760	10,668	7,990	811	203	717	34,150
Total	1990	18,069	11,475	7,082	569	258	535	37,988
	1991	18,104	10,488	7,384	662	273	563	37,474
	1992	17,494	10,737	7,320	700	317	585	37,153
	1993	17,364	10,231	6,912	704	389	625	36,225
	1994	17,196	10,668	7,996	830	376	815	37,881

Passenger miles, like transit ridership, are concentrated in large UZAs. Given the interaction between these two measures, it is not surprising to find that, historically, approximately 90 percent of all passenger miles occurred in these larger UZAs. The remaining 10 percent was split between the mid-size UZAs, with 7.3 percent, and the small UZAs, with 2.5 percent. Examination of the modal data indicates that demand response is the only mode to show growth among all UZAs over the 5-year period, with 63.8 percent in small areas, 29.7 percent in mid-size UZAs, and 48.1 percent in large UZAs between 1990 and 1994. The other area of significant growth occurred in light rail passenger miles, which posted a 47.7 percent increase in large UZAs. Heavy rail experienced a decline in passenger miles for the 1990-1994 timeframe with 7 percent, but had an increase of 4.3 percent from 1993 to 1994. This increase is impressive, taking into account a reporting change by Boston that reported in 1994 as light rail some lines that were reported as heavy rail in the past. These lines have high ridership and passenger miles. Bus experienced growth in passenger miles for both small and mid-size UZAs with 12.7 and 2.3 percent, respectively, and a 6.9 percent decrease in large UZAs. Bus displayed a consistent trend of decline in ridership and passenger miles in large UZAs over the 1990-1994 timeframe. Commuter rail displayed an increase in passenger miles between 1990 and 1994, with 12.8 percent, and an increase of 15.6 percent from 1993 to 1994.

Operating Expense Per Vehicle Revenue Mile by UZA Size and Mode

Operating expense per vehicle revenue miles by UZA size for each mode is displayed in **Exhibit 102**. A weighted average for this exhibit and the three exhibits which follow in this chapter have been computed for each mode. The cost per mile for bus and demand response service has a direct relationship to UZA size: cost increases with population size. The cost per bus vehicle revenue mile in large UZAs is 84.2 percent greater than in small UZAs and 52.2 percent greater than in mid-size UZAs. The differences are not as great for demand response, in which the cost per mile in large UZAs is 18 percent higher than in small and mid-size UZAs. The opposite is true for light rail and commuter rail, where the cost per mile in large UZAs is lower than in mid-size UZAs: 18.5 percent lower for commuter rail and 16.4 percent lower for light rail.

Exhibit 102

Operating Expense Per Vehicle Revenue Mile by UZA Size and Mode
1994

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	$3.37	-	-	$13.00	$2.11
200,000 to 1 Million	4.09	-	$13.04	14.73	2.11
Over 1 Million	6.22	$7.34	10.63	12.30	2.48
Weighted Average	$5.59	$7.34	$10.63	$12.38	$2.32

Operating Expense Per Unlinked Passenger Trip by UZA Size and Mode

The cost effectiveness of each mode by UZA size as measured by the cost per unlinked passenger trip can be seen in **Exhibit 103**. The cost effectiveness of bus service does not vary greatly by UZA size. Bus service is 6.2 percent greater in small UZAs and 4.3 percent greater in large UZAs compared with the cost per trip for 200,000 to 1 million populated UZAs. Demand response is more cost effective in small UZAs than in mid-size and large UZAs, contrasting with high capacity modes such as commuter rail and light rail that show a trend of better cost effectiveness in large UZAs.

Exhibit 103

Operating Expense Per Unlinked Passenger Trip by UZA Size and Mode
1994

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	$1.96	-	-	$2.17	$8.41
200,000 to 1 Million	1.84	-	$20.24	1.70	11.20
Over 1 Million	1.92	$1.75	6.56	1.45	13.29
Weighted Average	$1.91	$1.75	$6.57	$1.46	$11.74

Operating Expense Per Passenger Mile by UZA Size and Mode

Operating expense per passenger mile by UZA area size and mode is displayed in **Exhibit 104**. This measure of cost effectiveness displays some of the same trends as those found in the cost per trip ratios. Specifically, the cost per passenger mile for bus is lower in mid-size UZAs, with 9.7 percent, and slightly higher in large UZAs, at 1 percent, compared with the small UZAs. In addition, the cost of demand response service increases with urbanized area size: 17.9 percent higher for mid-size UZAs and 49.3 percent higher for large UZAs when compared with the cost in small areas. Light rail and commuter rail show the opposite pattern; their cost per mile decreases as the UZA size increases. Light rail costs decrease 24.2 percent when operations occur in mid-size UZAs as opposed to small UZAs. In large UZAs, cost decreases 51.3 percent. A decrease of 72.4 percent occurs for commuter rail when comparing the cost per passenger mile in mid-size UZAs with the cost in large areas.

Exhibit 104

Operating Expense Per Passenger Mile by UZA Size and Mode
1994

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	$0.53	-	-	$1.00	$1.28
200,000 to 1 Million	0.47	-	$1.01	0.76	1.51
Over 1 Million	0.52	$0.35	0.28	0.49	1.92
Weighted Average	$0.52	$0.35	$0.28	$0.50	$1.68

Average Operating Speed by UZA Size and Mode

Average operating speed of each mode by UZA size can be seen in **Exhibit 105**. Bus service in large UZAs operates 8.6 and 9.4 percent slower than in mid-size and small UZAs, respectively. Demand response and light rail, however, show a different pattern. The average operating speed of demand response service in mid-size UZAs is 12.5 percent higher than for small UZAs. For large UZAs, the average operating speed for demand response is 3.4 percent higher than for small UZAs. The operating speed of light rail, however, increases dramatically with UZA size.

Exhibit 105

Average Operating Speed by UZA Size and Mode
1994

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	13.89	-	-	4.53	13.24
200,000 to 1 Million	13.77	-	42.26	10.66	14.90
Over 1 Million	12.58	20.68	33.79	14.57	13.69
Weighted Average	12.89	20.68	33.80	14.39	13.89

Chapter 7
Safety

Introduction

This chapter discusses an important measure of service quality: operations safety. Data regarding safety-related incidents are presented for each of the five major modes.

Chapter Organization

The chapter discusses safety of transit operations as measured by collision and non-collision incidents, as well as by comparison among injuries, fatalities, and property damage. Data are reported only for directly operated service; therefore, absolute figures for injuries, fatalities, and property damage are understated. This is especially true for modes such as demand response, which has a substantial amount of data reported as purchased transportation in the National Transit Database. The figures for heavy rail and light rail are not understated, because they are reported as directly operated.

Several exhibits in this chapter present ratios between variables related to safety, such as incidents, injuries, and fatalities, and those related to service consumption, such as unlinked passenger trips and passenger miles. These exhibits reflect more accurately the trends for safety in the last 5 years, because service consumption data are reported for both directly operated service and purchased transportation. Accordingly, the proportion of directly operated service to the total universe of reporters is large enough to guarantee a satisfactory level of confidence and tolerance for the ratios between variables for safety and those for service consumption.

General Notes

Collision incidents are those that involve one or more transit agency vehicles colliding with any other vehicle, obstacle, or person. Non-collision incidents involve derailments; buses or other transit vehicles leaving the roadway; personal injuries incurred while inside the transit vehicle resulting from sudden braking or unexpected swerving; falls or other mishaps experienced while boarding or alighting; and injuries sustained at stations or bus stops. All incidents resulting in an injury or fatality and all incidents with transit property damage in excess of $1,000 are reported, as well as incidents involving fire.

Total Reported Incidents By Mode

Exhibit 106 provides total reportable incidents by mode from 1990 to 1994. The total number of incidents reported decreased from 1990 to 1993. The number of incidents decreased nearly 29 percent from 1990 to 1993 and increased by approximately 7 percent from 1993 to 1994. One possible explanation for a greater number of incidents is the increase in service consumption observed in 1994 with the addition of new reporters and the expansion in the ridership of existing ones. At the modal level, every mode experienced a decrease in the number of incidents for the 1990-1994 timeframe, with the exception of heavy rail, which increased 21.4 percent between 1990 and 1994. The greatest decrease was experienced by demand response, with a decrease of 46 percent for the 1990-1994 timeframe. The number of incidents for bus decreased by nearly 33 percent. Incidents for commuter rail and light rail decreased by 11 and 12 percent, respectively, during the same period. Comparing the data for 1993 with that for 1994, commuter rail experienced the greatest increase in incidents with a 47.5 percent gain.

Exhibit 106

Total Reported Incidents by Mode
Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	71,636	66,036	52,381	45,545	47,924
Heavy Rail	13,070	14,917	15,512	15,082	15,862
Commuter Rail	3,500	3,236	3,235	2,111	3,115
Light Rail	1,606	1,700	1,520	1,182	1,413
Demand Response	1,961	1,457	1,147	973	1,051
Total	91,773	87,346	73,795	64,893	69,365

Total Fatalities by Mode

A trend similar to incidents is depicted in **Exhibit 107** for the number of fatalities. The number of fatalities decreased from 1990 to 1993 and increased by nearly 18 percent from 1993 to 1994. At the modal level, commuter rail and light rail reported significant increases in the number of fatalities for the 1990-1994 timeframe. For commuter rail, fatalities increased by 14.3 percent. The data for light rail displayed erratic behavior with ups and downs along the timeframe considered. As expected, the number of fatalities by

Exhibit 107

Total Fatalities by Mode
Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	110	87	99	83	105
Heavy Rail	112	100	91	83	85
Commuter Rail	98	93	80	86	112
Light Rail	5	13	7	15	13
Demand Response	0	3	0	2	2
Total	325	296	277	269	317

Total Injuries by Mode

mode for any given year tends to be greater for modes with the highest levels of ridership, such as bus and heavy rail. Demand response, with the smallest number of fatalities in 1994, is the mode with the lowest level of ridership among the five modes considered. Total injuries by mode are presented in **Exhibit 108**. These figures not only include injuries experienced by passengers in both collision and non-collision incidents but also injuries experienced by non-passengers, such as auto passengers involved in an auto and bus incident.

Exhibit 108

Total Injuries by Mode
Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	39,301	38,164	39,552	38,300	41,663
Heavy Rail	10,178	9,282	10,446	10,532	11,666
Commuter Rail	2,328	2,308	2,546	1,560	2,374
Light Rail	1,260	1,251	1,269	982	1,181
Demand Response	777	620	705	649	721
Total	53,844	51,625	54,518	52,023	57,605

Total Property Damage by Mode

Total property damage for each of the major modes is presented in **Exhibit 109**. Bus experienced a small decline in property damage in 1994, with a decrease of 1.7 percent in relation to 1993. However, bus had nearly 78 percent of the total property damage in 1994. In 1993, the bus mode share of the total property damage was 68 percent, or 10 percent less than in 1994. Property damage decreased in 1994 for every mode except demand response and commuter rail. Demand response experienced an increase of approximately 42 percent while commuter rail had an increase of 31.4 percent. Data for bus and demand response are understated due to the substantial amount of purchased transportation service reported for these two modes.

Exhibit 109

Total Property Damage by Mode
Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	$27,316,045	$26,256,950	$24,793,067	$30,463,558	$29,949,017
Heavy Rail	7,929,642	6,525,828	7,333,790	9,003,757	1,597,031
Commuter Rail	861,513	1,295,623	2,986,769	3,911,643	5,140,604
Light Rail	1,144,000	1,008,107	1,184,825	801,082	784,719
Demand Response	609,484	868,482	1,080,698	549,804	778,653
Total	$37,860,684	$35,954,990	$37,379,149	$44,729,844	$38,250,024

Total Incidents Per 100 Million Passenger Miles by Mode

The number of incidents per 100 million passenger miles is indicated in **Exhibit 110**. Demand response displayed the greatest number of incidents per passenger mile, with 800.6 incidents per 100 million passenger miles. This figure is nearly 2.7 times greater than the second largest figure, which is 296 incidents per 100 million passenger miles for bus. Rail modes displayed a more favorable ratio because they are fixed guideway modes using exclusive rights-of-way with no interference from mixed traffic. An exception is light rail, which has some operators sharing the right-of-way with mixed traffic. In some degree, this explains light rail having the highest rate among the rail modes.

Exhibit 110

Total Incidents Per 100 Million Passenger Miles by Mode
Directly Operated Service
1990-1994

Mode	Incidents	Passenger Miles (Millions)	Incidents Per 100 Million Passenger Miles
Bus	47,924	16,195.50	295.9
Heavy Rail	15,862	10,668.03	148.7
Commuter Rail	3,115	7,366.33	42.3
Light Rail	1,413	831.04	170.0
Demand Response	1,051	131.28	800.6
Total	69,365	35,192.17	
Weighted Average			197.1

Total Incidents Per 100 Million Unlinked Passenger Trips by Mode

Incidents per 100 million unlinked passenger trips are presented in **Exhibit 111**. The relative safety of each of the five major modes is reflected in relation to the ridership that each mode realizes. Again, the rail modes show the lowest rates of incidents per 100 million unlinked passenger trips. Bus displayed a higher rate than rail, with 1,070 incidents per 100 million unlinked passenger trips, and demand response displayed a rate almost 6 times greater than bus.

Exhibit 111

Total Incidents Per 100 Million Unlinked Passenger Trips by Mode
Directly Operated Service
1994

Mode	Incidents	Unlinked Passenger Trips (Millions)	Incidents Per 100 Million Unlinked Passenger Trips
Bus	47,924	4,478.3	1,070.0
Heavy Rail	15,862	2,169.4	731.0
Commuter Rail	3,115	317.8	980.0
Light Rail	1,413	282.2	501.0
Demand Response	1,051	16.8	6,256.0
Total	69,365	7,264.5	
Weighted Average			954.7

Total Injuries Per 100 Million Passenger Miles by Mode

The relative safety of the rail modes, compared with bus and demand response, is indicated in **Exhibit 112**. Commuter rail experienced an extremely low rate of 32.2 injuries per 100 million passenger miles. Demand response is the mode with the highest rate, amassing 549.2 injuries per 100 million unlinked passenger trips. This is nearly twice the rate for bus.

Exhibit 112

Total Injuries Per 100 Million Passenger Miles by Mode
Directly Operated Service
1994

Mode	Injuries	Passenger Miles (Millions)	Injuries Per 100 Million Passenger Miles
Bus	41,663	16,195.5	257.3
Heavy Rail	11,666	10,668.0	109.4
Commuter Rail	2,374	7,366.3	32.2
Light Rail	1,181	831.0	142.0
Demand Response	721	131.3	549.2
Total	57,605	35,192.1	
Weighted Average			163.7

Total Injuries Per 100 Million Unlinked Passenger Trips

The relative safety of rail modes, as measured by the ratio between injuries and unlinked passenger trips, compared with bus and demand response is presented in **Exhibit 113**. Light rail's rate of 418.5 injuries per 100 million unlinked passenger trips is approximately 10 times smaller than demand response's rate of 4,292 injuries.

Exhibit 113

Total Injuries Per 100 Million Unlinked Passenger Trips by Mode
Directly Operated Service
1994

Mode	Injuries	Unlinked Passenger Trips (Millions)	Injuries Per 100 Million Unlinked Passenger Trips
Bus	41,663	4,478.3	930.3
Heavy Rail	11,666	2,169.4	538.0
Commuter Rail	2,374	317.8	747.0
Light Rail	1,181	282.2	418.5
Demand Response	721	16.8	4,292.0
Total	57,605	7,264.5	
Weighted Average			793.0

Fatalities Per 100 Million Passenger Miles

The very low fatality rates experienced by all modes when measured in terms of passenger miles is presented in **Exhibit 114**. Light rail displays the highest rate, with 1.6 fatalities per 100 million passenger miles. Commuter rail and demand response experienced an identical rate of 1.5. Bus and heavy rail show rates below the national average of .9 fatalities per 100 million passenger miles. The rate for bus is 22.2 percent smaller than the national average, while heavy rail is 11.1 percent smaller.

Exhibit 114

Total Fatalities Per 100 Million Passenger Miles by Mode
Directly Operated Service
1994

Mode	Fatalities	Passenger Miles (Millions)	Fatalities Per 100 Million Passenger Miles
Bus	105	16,195.5	0.7
Heavy Rail	85	10,668.0	0.8
Commuter Rail	112	7,336.3	1.5
Light Rail	13	831.0	1.6
Demand Response	2	131.3	1.5
Total	317	35,162.1	
Weighted Average			0.9

Fatalities Per 100 Million Unlinked Passenger Trips

Exhibit 115 displayed the high incidence of fatalities per 100 million unlinked passenger trips for commuter rail, with a rate of 35.2 fatalities. Demand response shows a rate of 12 fatalities per 100 million unlinked passenger trips. The rates for heavy rail and light rail are 3.9 and 4.6, respectively. Heavy rail's rate is 9 percent smaller than the national average. Bus displayed the lowest rate, with only 2.3 fatalities per 100 million unlinked passenger trips.

Exhibit 115

Total Fatalities Per 100 Million Unlinked Passenger Trips by Mode
Directly Operated Service
1994

Mode	Fatalities	Unlinked Passenger Trips (Millions)	Fatalities Per 100 Million Unlinked Passenger Trips
Bus	105	4,478.2	2.3
Heavy Rail	85	2,169.4	3.9
Commuter Rail	112	317.8	35.2
Light Rail	13	282.2	4.6
Demand Response	2	16.8	12.0
Total	317	7,264.4	
Weighted Average			4.3

The various rates per 100 million passenger miles for incidents, injuries, and fatalities for each mode are summarized in **Exhibit 116**.

Incident, Injury, and Fatality Rates Per 100 Million Passenger Miles by Mode

Exhibit 116

Total Incidents, Injuries, and Fatalities Per 100 Million Passenger Miles by Mode Directly Operated Service 1994

Mode	Incident Rate	Injury Rate	Fatality Rate
Bus	295.9	257.3	0.7
Heavy Rail	148.7	109.4	0.8
Commuter Rail	42.3	32.2	1.5
Light Rail	170.0	142.0	1.6
Demand Response	800.0	549.2	1.5
Weighted Average	197.1	163.7	0.9

The various rates per 100 million unlinked passenger trips for incidents, injuries, and fatalities for each mode are summarized in **Exhibit 117**.

Incident, Injury, and Fatality Rates Per 100 Million Unlinked Passenger Trips

Exhibit 117

Total Incidents, Injuries, and Fatalities Per 100 Million Unlinked Passenger Trips by Mode Directly Operated Service 1994

Mode	Incident Rate	Injury Rate	Fatality Rate
Bus	1,070	930.3	2.3
Heavy Rail	731	538.0	3.9
Commuter Rail	980	747.0	35.2
Light Rail	501	418.5	4.6
Demand Response	6,256	4,292.0	12.0
Weighted Average	955	793.0	4.3

Collision and Non-Collision Incidents by Mode

The number of collision and non-collision incidents by mode is presented in **Exhibit 118**. Bus accounted for the greatest portion of collision incidents, with 92.3 percent. For non-collision incidents, bus accounted for 50.5 percent and heavy rail accounted for 39.2 percent.

Exhibit 118

Collision and Non-Collision Incidents by Mode
Directly Operated Service
1994

Mode	Collision Incidents	Non-Collision Incidents	Total
Bus	26,721	21,429	48,150
Heavy Rail	830	16,647	17,477
Commuter Rail	265	2,920	3,185
Light Rail	477	986	1,463
Demand Response	644	453	1,097
Total	28,937	42,435	71,372

Chapter 8
Reliability and Maintenance Effectiveness

Introduction

This chapter discusses measures of service quality, such as service reliability and the effectiveness of transit maintenance. While there are numerous measures of service quality in the transit industry, the data presented in this chapter are based on the information reported by the nation's transit agencies.

Chapter Organization

The chapter reviews service reliability in terms of the number of vehicle revenue miles between roadcalls and discusses maintenance effectiveness by examining maintenance expense per vehicle revenue mile of service for each mode.

General Notes

Before reviewing this chapter, some items should be noted. The appropriate definition of roadcalls and consistent reporting of roadcalls within the transit industry have not been fully resolved. Roadcalls discussed herein are roadcalls for mechanical failure, as defined in the *1994 Reporting Manual*. Thus, revenue service interruptions caused by failure of some mechanical element of the revenue vehicle are considered. These interruptions include breakdowns of air equipment, brushes, fuel system, engine, steering and front axle, rear axle and suspension, torque convertors, electrical units, and heating and cooling systems. These revenue service interruptions are ones that prevent a vehicle from running and that require someone other than the vehicle operator or crew member to restore the vehicle to an operating condition. It should be noted that roadcalls are not a measure of the number of times that vehicles in revenue service are put out of service. There are many situations in which a vehicle in revenue service is put out of service for non-mechanical reasons, such as accidents. Accidents, as an example, are events not necessarily counted as roadcalls in the National Transit Database (NTD) because an accident may not be related to a mechanical failure of the vehicle.

The NTD reporting deals with maintenance data only for directly operated service. Purchased transportation expenses are not typically reported as individual maintenance functions, but are generally reported with total purchased transportation costs, which are reported as either vehicle operations or general administration expenses.

Maintenance Performance Measures: Maintenance Expense Per Vehicle Revenue Mile

Maintenance costs will vary greatly by mode due to differences in infrastructure, such as vehicle type and complexity and fixed guideway. Rail modes have higher maintenance costs due to their fixed guideway nature among other factors. **Exhibit 119** displays the maintenance costs per vehicle revenue mile for the 1990-1994 period. All modes experienced increases in maintenance costs per revenue mile, with the exception of demand response. Rail modes experienced higher costs than bus and demand response. Among the rail modes, light rail is the highest, with a cost of $5.15 per vehicle revenue mile. This cost represents an increase of 7.3 percent compared with 1993. For the 1990-1994 timeframe, maintenance cost per vehicle revenue mile increased by 19.8 percent for light rail. Increases for commuter rail and heavy rail were 8.7 and 2.4 percent, respectively, compared with 1993. For the first time in the last 5 years, demand response displayed a decrease of 6 percent in maintenance cost per revenue mile. Bus displayed an increase of nearly 5 percent in relation to 1993.

Exhibit 119

Maintenance Expense Per Vehicle Revenue Mile by Mode
Directly Operated Service
1990-1994

Mode	1990	1991	1992	1993	1994
Bus	$1.33	$1.32	$1.38	$1.43	$1.50
Heavy Rail	2.93	3.00	3.08	2.85	2.91
Commuter Rail	4.29	4.25	4.38	4.34	4.71
Light Rail	4.30	4.43	4.50	4.80	5.15
Demand Response	0.35	0.44	0.44	0.45	0.42
Other	3.07	3.15	3.72	2.62	2.81

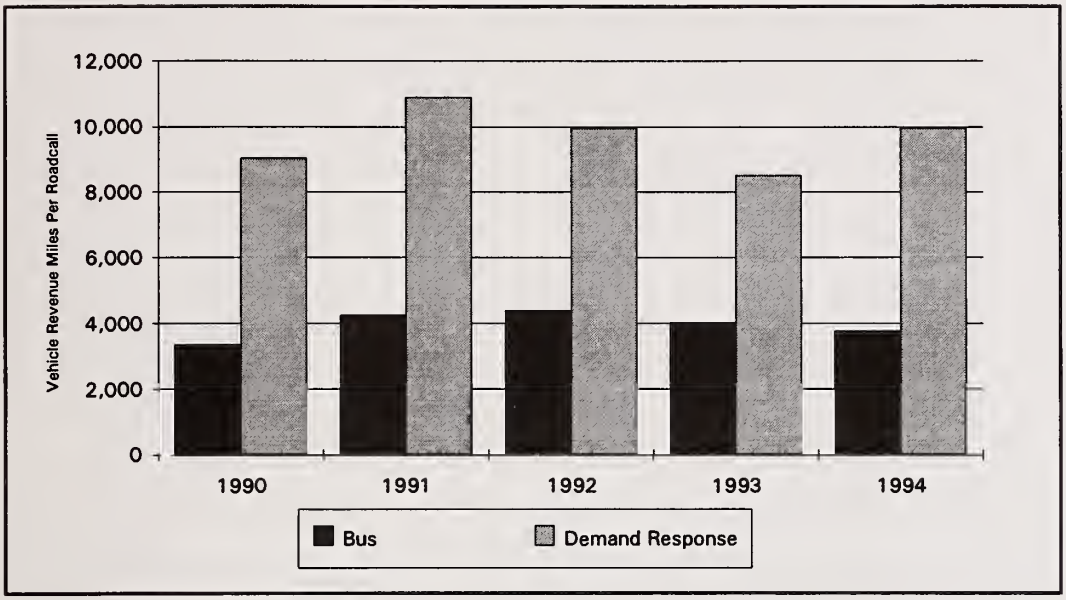
Vehicle Revenue Miles Per Mechanical Roadcall

Reporting of roadcall data for the NTD is required only for directly operated non-fixed guideway modes. Transit agencies have the option to report fixed guideway modes, such as rail modes, but are not required to do so. Thus, the only data available that are sufficient for a historical comparison are the data for bus and demand response because other non-fixed guideway modes have minimal participation in the NTD. Because of reporting changes and clarifications to the roadcall definition, analysis of changes over time is limited. Nonetheless, the number of miles between roadcalls is a common measure of maintenance performance within the transit industry.

As shown in **Exhibit 120**, bus experienced an increase in revenue miles between roadcalls for the 1990-1992 period. Starting in 1993, the trend changed, and there have been decreases in 1993 and 1994. The decrease in 1994 is 6.6 percent in relation to 1993, and 8.4 percent from 1992 to 1993. Demand response decreased in revenue miles per mechanical roadcall from 1991 to 1993. However, this figure increased substantially in 1994, reaching the same level observed in 1991. The increase in 1994 is 17.1 percent compared with 1993.

Exhibit 120

Vehicle Revenue Miles Per Mechanical Roadcall
Directly Operated Service
1990-1994



Ratio of Vehicle Maintenance Expenses to Total Operating Expenses

The ratio of vehicle maintenance expenses to total operating expenses from 1990 to 1994 is indicated in **Exhibit 121**. While vehicle maintenance expenses accounted for 19.2 percent of total operating expenses in 1994, an increase of over 1.5 percent from 1993, the expenses were less than the 19.5 percent reported in 1990. Also, total vehicle maintenance expenses in 1994 were 9.2 percent greater than expenses of 1990.

Exhibit 121

Ratio of Vehicle Maintenance Expenses to Total Operating Expenses
Directly Operated Service
(Millions)
1990-1994

Year	Vehicle Maintenance Expenses	Total Operating Expenses	Ratio of Vehicle Maintenance Expenses to Total Operating Expenses
1990	$2,874.0	$14,714.6	19.5%
1991	2,882.0	15,404.1	18.8
1992	2,902.4	15,498.5	18.7
1993	2,919.5	15,472.7	18.9
1994	3,137.6	16,319.9	19.2

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